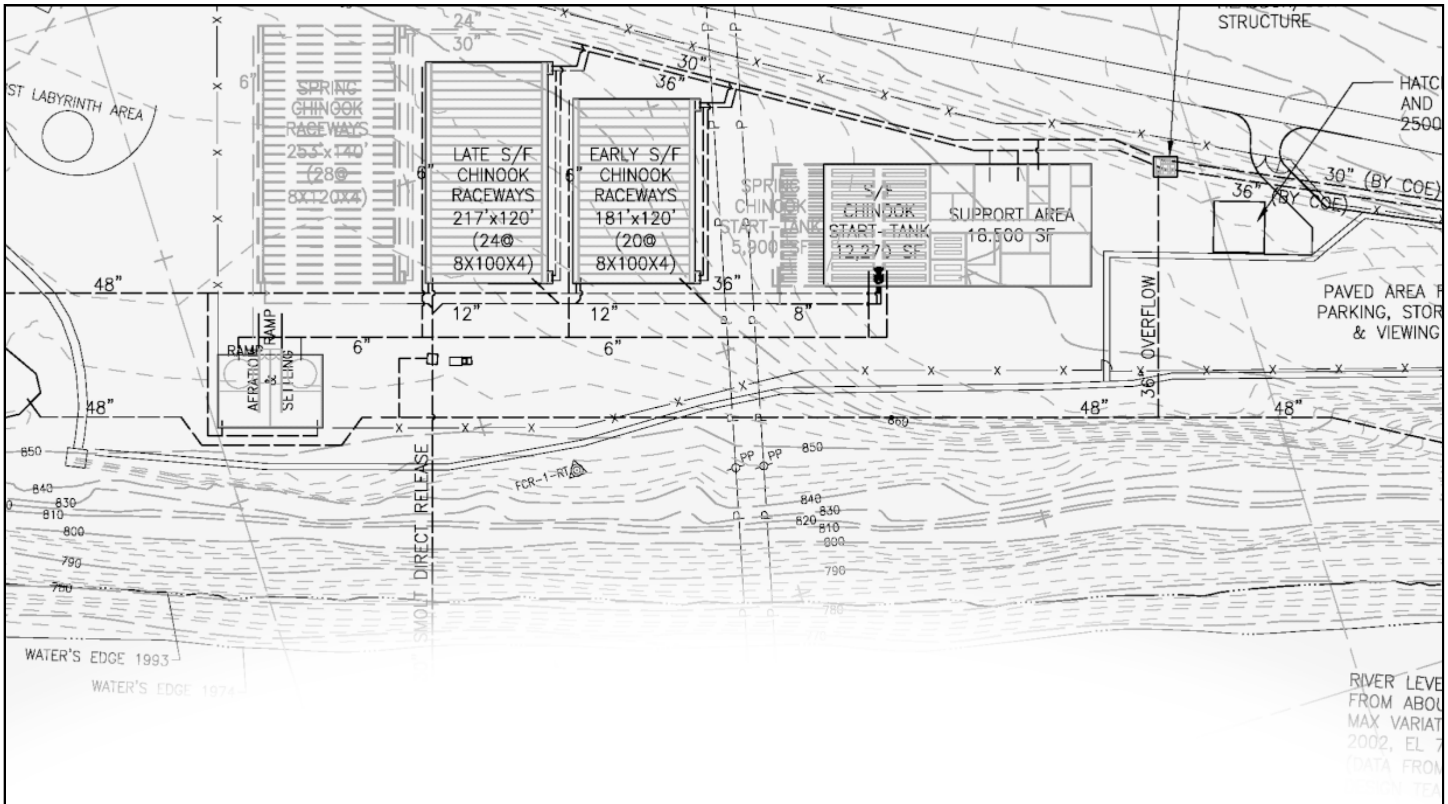


11. Facility Conceptual Design

Chief Joseph Dam Hatchery Program

MASTER PLAN

11

Facility Conceptual Design

The following chapter includes a summary of the conceptual design of the CJDHP facilities. The first section of this chapter includes an overview of the results of a preliminary hatchery water supply study, subsequent sections include an overview of the proposed Chief Joseph Dam Hatchery fish rearing facilities, new and existing acclimation ponds, and other necessary hatchery related facilities.

11.1 WATER SUPPLY

Water is the essential component of a hatchery facility. As part of the Step 1 conceptual facility design work for the CJDHP, the U.S. Army Corps of Engineers (COE) was contracted to perform a limited study of water sources for the hatchery facility. The purpose of the study was to evaluate and confirm potential water sources for the proposed hatchery at the Chief Joseph Dam site, evaluate and confirm the quality of those water sources, recommend a preferred water source(s), recommend possible water conveyance methods, and provide preliminary cost estimates associated with water conveyance. In addition, in their study the COE sought to determine if the necessary water could be provided in a manner that did not pose a risk to dam safety, and that would pose minimal cost to the federal government.

The COE's final report includes a summary of available water sources, the range of alternatives considered, groundwater, hydraulic analysis, structural require-

Relationship of Conceptual Design to CJDHP Guiding Principles

Accountability
- Use of inter-disciplinary planning team in design development to identify best approaches, and reduce uncertainty and inconsistencies later in the project

Best Available Science
- Facility design incorporates latest information related to disease control and early rearing environments
- Use of low density rearing in all facilities

Cost-Effectiveness
- Inclusion of value analysis (value engineering) in preliminary planning design
- Use of existing irrigation ponds for acclimation facilities
- Potential for shared use of some facilities and staff (e.g. Colville Trout Hatchery)

Flexibility
- Variable water temperature management
- Variable release locations
- Inter- and intra-program adaptability
- Design allows for future changes related to brood collection, eggtake, incubation and rearing

Innovation
- Unique water supply (e.g. of water supplies at the dam allow for creative water temperature mixing to mimic natural environmental situations)
- Use of live-capture, selective fishing gear to collect broodstock

ments, water quality data, and a cost estimate to deliver water necessary to the operations of the Chief Joseph Dam Hatchery facility to the hatchery headbox [see Appendix F].

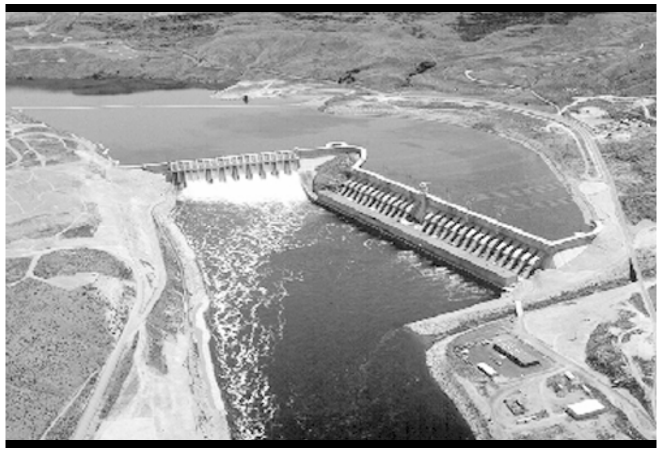


FIGURE 27: Photo Chief Joseph Dam

A more detailed investigation will be required in the next phase of design to confirm the assumptions and cost estimates developed in the COE study and to address dam safety issues. In particular, information regarding the availability, quantity and quality of the water supply in the aquifer above Chief Joseph Dam (possible wells near State park) will need to be further refined. The temperature of water at various depths near the Rufus Woods Lake intake will also need to be determined. Moreover, the water requirements for the hatchery facilities will be additionally refined in the next planning stages. These issues will need to be addressed in the Step 2 planning process.

The following sections summarize key findings of the water supply report. The complete COE Chief Joseph Dam Hatchery Water Supply report is presented in Appendix F. The complete discussion of the conceptual facility design is included in Appendix G.

11.1.1 BACKGROUND

Project consultants working with the Colville Tribes provided the COE with initial estimates of water requirements for the Chief Joseph Dam Hatchery facilities. These requirements included fish rearing and fish attraction water. Specific water requirements for fish rearing were later refined based on a bioengineering model developed by Tetra Tech/KCM to establish the quantities of each water source necessary to meet the various rearing program temperature and biological flow requirements.

Based on these preliminary estimates the COE reviewed a number of potential sources of water and narrowed the options down to three preferred sources. These preferred water sources include: a relief tunnel that extends approximately 1,000-feet from the northwest end of the Dam's Monolith 1, to below the right abutment Chief Joseph Dam; water from Rufus Woods Lake reservoir; and groundwater wells located in a State park approximately 2.5 miles upstream of the hatchery site. The COE's water report includes review of a number of other water sources that were considered and discussion of the reasons they were not deemed suitable choices.

The conceptual design of the Chief Joseph Dam Hatchery requires a combination of reservoir water from the Rufus Woods Lake and groundwater to meet the various rearing program temperature and biological flow requirements. The water from groundwater sources will be mixed with the reservoir water to cool or warm (depending on the season) the temperature of the reservoir water in order to meet optimal juvenile fish rearing conditions.

Reservoir water is desirable because it will allow fish to be reared on their home waters, as well as providing a readily available and reliable water supply. Water from the relief tunnel is desirable for hatchery operations because the water temperature is 6-months out of phase with the temperature of the surface water. Therefore, the relief tunnel water will be warm in the winter and cool in the summer relative to the temperature of the river or reservoir water. Similarly, water extracted from the right bank groundwater wells would provide similar temperature variations.

11.1.2 RECOMMENDED WATER SOURCES

The Colville Tribes' hatchery consultants identified the maximum flow requirement for summer/fall Chinook of 24.5 cfs from the relief tunnel and wells, and 22 cfs from the reservoir. (If spring Chinook are added these flow requirements increase to 36.5 cfs of groundwater and 44 cfs of reservoir water.) The hatchery design is ongoing and the flow requirements are subject to further revision.

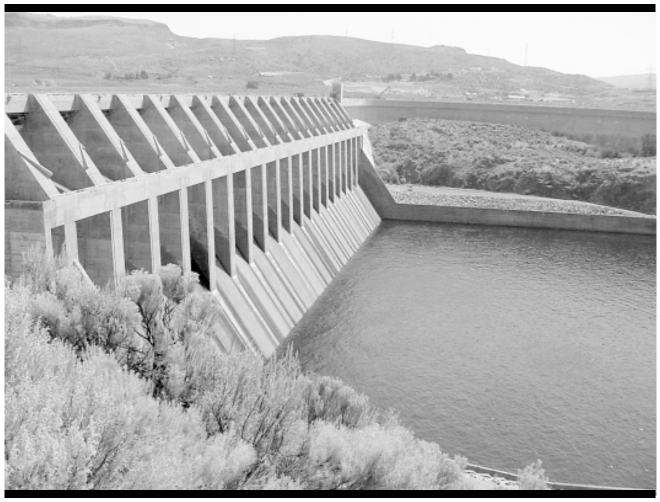

Bill Towey

FIGURE 28: Photo Chief Joseph Dam from Right Abutment

The COE's preliminary study determined that approximately 20 cfs could be supplied from the relief tunnel by enlarging the existing relief tunnel sump and installing a 450 HP pump. Approximately 45 cfs can be provided from the reservoir by opening an existing, but never used, irrigation inlet and outlet on the upstream and downstream faces of the dam, and installing a 30-inch diameter metal pipe with an emergency gate valve, trash rack, fish screen, and stoplogs. Additional groundwater could be obtained form the aquifer located above Chief Joseph Dam.

11.1.2.1 Relief Tunnel

The relief tunnel would be used to provide mixing water for the hatchery fish rearing facilities. As noted previously, the relief tunnel water is desirable because of its quality and because its temperature is approximately six months out of phase with river and reservoir water.

The relief tunnel at the Chief Joseph Dam extends approximately 1,000-feet from the northwest end of Monolith 1 past the right abutment. Access to the relief tunnel is provided via galleries located in the interior of the dam. The tunnel was designed to reduce pore pressure in the soil of the Dam's right abutment. Water drains into the relief tunnel through wells located in the floor of the tunnel. These wells are constructed of wood staves. Outflow from the tunnel was originally 95 cfs at the time of the relief tunnel's construction. For the past 20-30 years the outflow has been 20-25 cfs. The tunnel drains into a sump, which in turn connects to a 4-foot diameter conduit. This conduit exits through the spray wall north of spill bay number one. The elevation of the bottom of the sump is 777 feet. The tunnel is typically flooded with water because the elevation of the tail water is generally above the elevation of the relief tunnel outlet at elevation 783 feet [see Appendix F for additional detail including schematics].

The quality of the relief tunnel water is good due to the filtering effects of the granular media through which the water percolates to the relief tunnel. This filtration is assumed to remove parasitic organisms that could be detrimental to the health of juvenile fish.

Obtaining water from the relief tunnel will require physical changes near Chief Joseph Dam and may create dam safety impacts that will need to be investigated during the next phase of design. Structural modifications near the dam will be required to access the relief tunnel. The existing sump and part of the relief tunnel will have to be demolished and a new larger sump and weir installed. Pumps will be required to remove the water from the sump and lift this water to a pipeline that would be connected to the fish hatchery.

11.1.2.2 Irrigation Inlet

An existing irrigation inlet would be used to provide water for the hatchery from Rufus Woods Lake. The irrigation inlet is located in Monolith No. 2 on the right side of the dam. This inlet was built during the initial dam construction but has never been used. The irrigation inlet will require a new gate and construction of internal walls and decking before use. Water from the inlet will flow through a closed pipe to the hatchery site.

The elevation of the outlet is 920 feet. The water from the inlet would drop 50 feet over a distance of 2,700 feet to the hatchery headbox at elevation 870. The inlet has two openings that are 4-feet wide and 5-feet high.

There are a number of concerns that will need to be addressed in developing this water source. The right bank is composed of material that is easily eroded. In addition, the increase in the moisture in the soils that compose the right bank could result in a decrease in slope stability. Any pipeline constructed in the right bank must be free of leaks and placed in a lined trench that is well drained. Monitoring instruments, such as open standpipe, will be required along the alignment of the pipe to allow testing for the presence of pipe leakage or the presence of water in the trench due to infiltration of precipitation.

11.1.2.3 Right Bank Well Field

Water from the well fields would be used to provide additional mixing water for the fish rearing facilities at the hatchery. In addition to the water required for hatchery operations, the well water may be necessary to provide potable water for a small number of residences associated with the hatchery facilities.

At this stage of planning the COE study recommended installation of a well field approximately 2.5 miles upstream in a nearby state park. This location is upstream of an impermeable seepage blanket on the right bank. The subsurface geology and the presence of water bearing strata capable of providing the required hatchery flows will determine the size and design of the well field(s). Additional testing to determine the quantity, quality and accessibility of this water source will be necessary in Step 2.

11.1.3 WATER CONVEYANCE

In order to obtain hatchery water from either the relief tunnel or Rufus Woods Lake, pipelines approximately 3,000 feet long will need to be constructed on the north bank of the river from the base of the spillway.

Conveyance of the relief tunnel water to the hatchery site will require a 20-inch diameter metal pipe. Conveyance of the reservoir water will require a 30-inch diameter metal pipe. The pipes will need to be buried for seismic and security considerations and would run approximately 300 feet through the riprap on the embankment and approximately 2,400 feet under the existing road. This will require demolition and repaving the road and excavating a pipe trench 8-feet deep by 11-feet wide.

At this time, it is understood that the COE will be responsible for development of the water sources from both the Rufus Woods Lake and the relief tunnel to the hatchery site. The COE will design and construct the facilities necessary to convey the required water volumes from each source to an agreed upon location in the vicinity of the main hatchery headbox.

11.1.4 WATER QUALITY

Initial water quality testing of samples from the relief tunnel and the reservoir forebay at the elevation of the irrigation intake indicates good water quality at the relief tunnel and forebay locations. Neither the WDFW nor Washington Department of Ecology (WDOE) water quality criteria were exceeded in either case. The water quality parameters that were monitored show little difference between the relief tunnel and the forebay samples. Water quality samples will be collected at the relief tunnel, forebay, and hatchery well site in the spring and summer to determine if any seasonal variations in water quality exist for these source waters.

11.1.5 WATER REQUIREMENTS

11.1.5.1 Fish Rearing Water

Based on the size of the raceways, rearing densities, water mixing requirements (temperature) and other considerations, summer/fall Chinook flow requirements for the hatchery were identified as 24.5 cfs from the relief tunnel, and 22 cfs from the reservoir.

If spring Chinook facilities are included at the hatchery the required water quantities for water mixing to achieve desired temperatures would increase to a total of 36.5 cfs from the combined relief tunnel and well sources, and 44 cfs from Rufus Woods Lake.

11.1.5.2 Attraction Flow Water

In addition to the water requirement for fish rearing, approximately 500 cfs will need to be supplied from the Columbia River via low head pumps in order to provide adequate attraction flow at the fish ladder to the hatchery. Rearing water from the hatchery will provide the ladder flow from the adult holding ponds to the fishway entrance at the river bank.

11.1.5.3 Potable Water

Potable water is currently supplied to the nearby COE Visitor Orientation Center from the City of Bridgeport through a 2-inch water line that crosses the river attached to the SR-17 bridge. The City of Bridgeport has indicated that it cannot add more services to its water system until significant improvements are made to the system and approval is obtained from state agencies. If in the future Bridgeport has water available to provide service to the hatchery, a larger pipeline would need to be constructed across the bridge.

There does not appear to be sufficient groundwater available near the hatchery site to develop a well. If wells are developed in the nearby state park and water lines extended to the hatchery for fish production, the water could also be used for a potable source. Further analysis and design of a potable water system will be performed in Step 2 of the Council's three-step process.

11.2 MAJOR PROJECT ELEMENTS

The Council's Step 1 Master Planning process requires development of a conceptual design for artificial production facilities. Additional refinements of the facility design will be made at Step 2, and a final design would be presented at Step 3.

Table 16: Summary of Proposed CJDHP Summer/Fall Chinook Production Programs

Program Number[a]	Release Numbers	Release Age	Transfer Date	Transfer Size	Transfer/ Release Location	Release Date	Release Size
BASIC PROGRAMS							
Early Summer/Fall Chinook							
1.1	200,000	Sub-yearling	-	-	CJDH	6/15	40/lb
2.1	300,000	Yearling	-	-	CJDH	4/15	10/lb
2.2	400,000	Yearling	10/30	25/lb	Riverside Pond	4/15	10/lb
Late Summer/Fall Chinook							
3.1	300,000	Sub-yearling	4/15	100/lb	Omak Pond	6/15	50/lb
3.2	200,000	Sub-yearling	-	-	CJDH	6/15	50/lb
4.1	400,000	Yearling	10/30	25/lb	Omak Pond	4/15	10/lb
4.2	200,000	Yearling	-	-	CJDH	4/15	10/lb
Total	**2,000,000**						

a. Program numbers established in the bioengineering model.

The following sections describe the conceptual design for construction of all of the major new facilities associated with the Chief Joseph Dam Hatchery, and modifications that would be necessary to the existing acclimation ponds. Appendix G contains the complete conceptual design report. Table 16 summarizes the CJDHP summer/fall Chinook production programs.

Figure 29 shows the general layout of the facilities and major piping requirements for the Chief Joseph Dam Hatchery conceptual design. The major elements of the project are as follows:

- **Adult Fish Holding/Spawning** - The adult fish holding/spawning facilities will include a fish ladder with additional attraction water provided by a dedicated pumping station adjacent to the fish ladder entrance. The ladder will climb part way up the embankment to a series of holding/crowding structures and a spawning facility.
- **Incubation** - Within the hatchery building will be an incubation area containing two systems of egg incubation. One system will be a series of jar incubators and the other a series of vertical tray incubators.
- **Start Tanks** - A major portion of the hatchery building will be the start tank room. After the eggs have hatched and reached the "button-up" stage, the fry will be transferred from the incubators to the start tanks, where they will be started on an artificial diet and closely monitored for disease as they grow to a size acceptable for transfer out of the start tank room.
- **Raceways** - Exterior to the hatchery building will be concrete raceways used to extend the growth cycle of the fish rearing programs.
- **Acclimation Ponds** - Some of the rearing programs will be continued in off-site ponds. Water for the acclimation sites will be supplied from surface water sources.

11.3 DESIGN CRITERIA

The firm selected to develop the conceptual design, Tetra Tech/KCM, developed a bioengineering model to analyze each of the proposed fish rearing programs. Each production program was evaluated using the model with the criteria shown in Tables 17 to 21. The model uses a computer spreadsheet format that can be modified if changes in production programs or criteria are considered.

The rearing water sources are Rufus Woods Lake and the north embankment relief tunnel of the Chief Joseph Dam. The monthly average temperature data provided for these sources were converted into weekly average temperatures. The weekly temperature values were input into the bioengineering model to establish the water flow rates required of each source to meet the various rearing program temperature and biological flow requirements. Flow rates were established based upon single-pass systems with no reuse.

Table 17: Bioengineering Criteria for CJDHP – Summer/Fall Chinook Adults

ADULT FISH*

Number of Fish Required (Male and Female Combined)
- Early summer/fall Chinook 286
- Additional early summer/fall Chinook for Riverside option: 222
- Late summer/fall Chinook: 618

Fecundity
- Early and late arriving summer/fall Chinook: .... 5,000 eggs/female

Holding Survival from Capture to Spawning
- Early and late arriving summer/fall Chinook: 90%

Holding Requirements
- Average adult weight: .... 20 lbs
- Minimum flow requirements: .... 1.0 gpm/fish
- Minimum pond turnovers per hour: 1.0
- Density of adults: .... 10.0 cu. ft./fish

* Abbreviations: ctu = Celsius temperature unit; cu. ft. = cubic feet; ftu = Fahrenheit temperature unit; gpm = gallons per minute; K = condition factor; L = length in centimeters; W = weight in grams

Table 18: Bioengineering Criteria for CJDHP – Summer/Fall Chinook Incubation

INCUBATION*

Incubator Information
- Heath incubator half stacks: ..... 8 usable trays/stack
- Water flow per half stack: .... 7.0 gpm
- Incubation temperature: .... 48.0°F

Fertilized Egg Incubator Capacity
- Early and late arriving summer/fall Chinook: .... 5,000 eggs/tray

Estimated Egg Survivals
- Green to eye-up 95%
- Eye-up to ponding 95%

Egg Development
- Green to eye-up
  - Early and late arriving summer/fall Chinook: .... 750 ftu
- Green to ponding
  - Early and late arriving summer/fall Chinook: .... 1,700 ftu

Table 19: Bioengineering Criteria for CJDHP – Summer/Fall Chinook Early Rearing in Start Tanks

TEMPORARY REARING IN START TANKS*

Size at Initial Ponding in Start Tanks
- Early and late arriving summer/fall Chinook: .... 0.45 grams

Size at Transfer to Raceways
- Early and late arriving summer/fall Chinook: .... 0.50 grams

Start Tank Density and Loading Criteria (all fish)
- Water flow requirements: .... 1.0 lbs/in/gpm
- Minimum pond turnover rate/hour: 1.0
- Fish density requirements: .... 0.30 lbs/cu. ft.

Start Tank Size
- Width (ft) 3
- Length (ft) 40
- Depth (ft) 2.50
- Volume in cu ft 300

Survival from Ponding to Transfer to Raceways (fed fry) 95.0%

Expected Growth Rate .... 0.04 mm/ctu/day

Condition Factor Used to Compute Length in Centimeters (K in W=KL^3) 0.01

Table 20: Bioengineering Criteria for CJDHP – Summer/Fall Chinook Rearing in Raceways

REARING IN RACEWAYS*

Size at Transfer to Raceways (fed fry)
- Early and late arriving summer/fall Chinook: .... 0.50 grams

Raceway Density and Loading Criteria (all fish)
- Water flow requirements: .... 1.0 lbs/in/gpm
- Minimum pond turnover rate/hour: 1.0
- Fish density requirements: .... 0.75 lbs/cu. ft.

Raceway Size for Early/Late Summer/Fall Chinook
- Width 8
- Length (feet) 100
- Depth (feet) 3.25
- Volume in cu. ft. 2,600

Raceway Size for Spring Chinook
- Width 8
- Length (feet) 120
- Depth (feet) 4
- Volume in cu. ft. 3,800

Rearing Survivals (all fish)
- Fed fry to fingerling (~10 grams): 95.0%
- Fingerling to smolt (~45 grams): 95.0%

Expected Growth Rate: .... 0.04 mm/ctu/day

Condition Factor Used to Compute Length in Centimeters (K in W=KL^3) 0.01

Table 21: Bioengineering Criteria for CJDHP – Summer/Fall Chinook Rearing in Acclimation Ponds

REARING IN ACCLIMATION PONDS*

Size at Transfer to Acclimation Ponds
- Early and late arriving summer/fall Chinook: .... variable

Pond Density and Loading Criteria (all fish)
- Water flow: .... .7 lbs/in/gpm
- Pond turnover rate/hour: 1.35
- Fish density (maximum): .... 0.75 lbs/cu. ft.

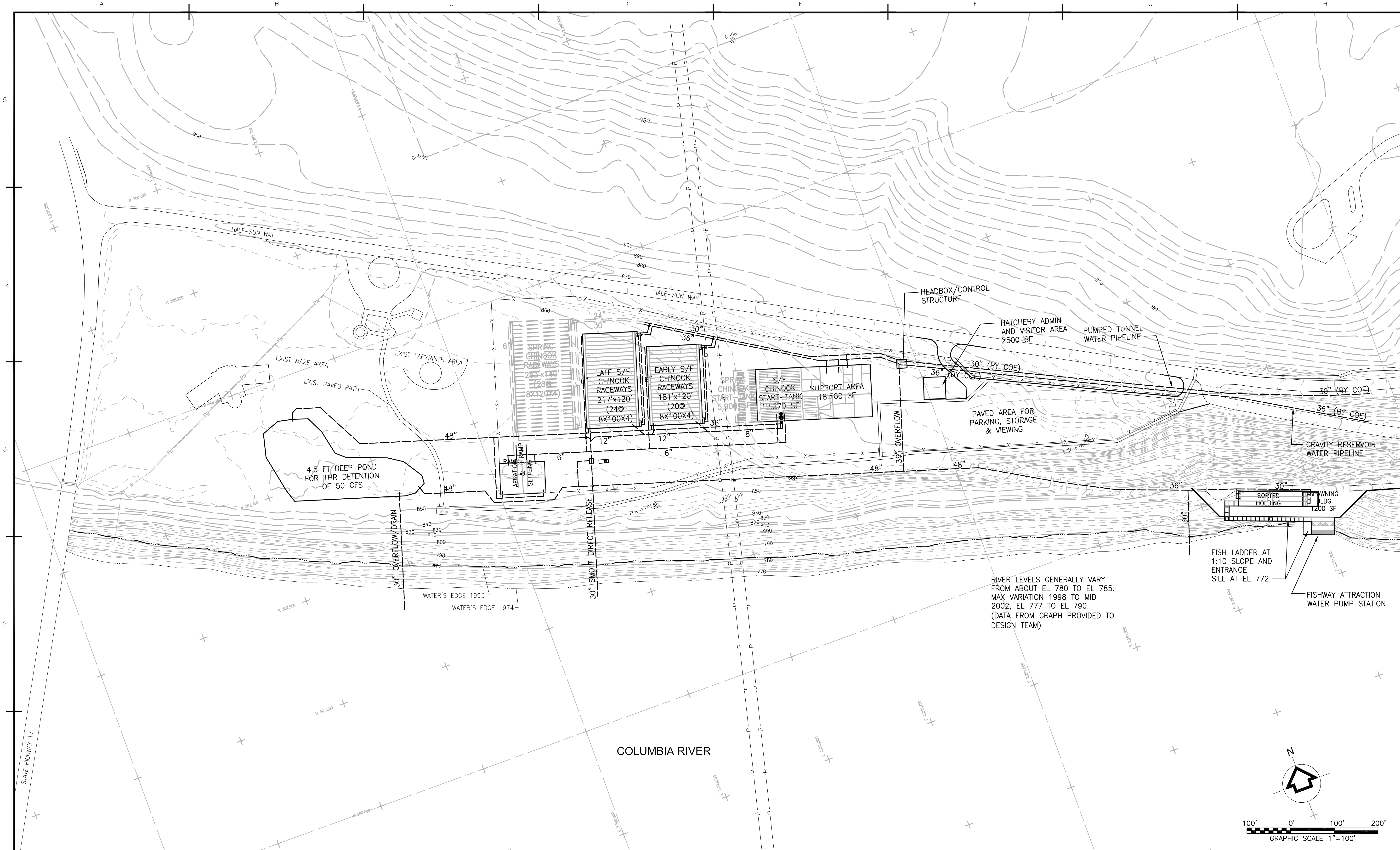
Pond Size Ratio (all fish)
- Width X
- Length 4X
- Depth (feet) 6.0
- Volume .... variable

Rearing Survivals (all fish), transfer to release 95.0%

Expected Growth Rate: .... 0.04 mm/ctu/day

Condition Factor Used to Compute Length in Centimeters (K in W=KL^3) 0.01

* Abbreviations: ctu = Celsius temperature unit; cu. ft. = cubic feet; ftu = Fahrenheit temperature unit; gpm = gallons per minute; K = condition factor; L = length in centimeters; W = weight in grams



TETRA TECH/KCM
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Seattle, Washington 98101-1027
(206) 443-5300 FAX (206) 443-5372

Colville Tribes
CHIEF JOSEPH DAM HATCHERY
CONCEPTUAL DESIGN

FIGURE 29
HATCHERY SITE PLAN

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"

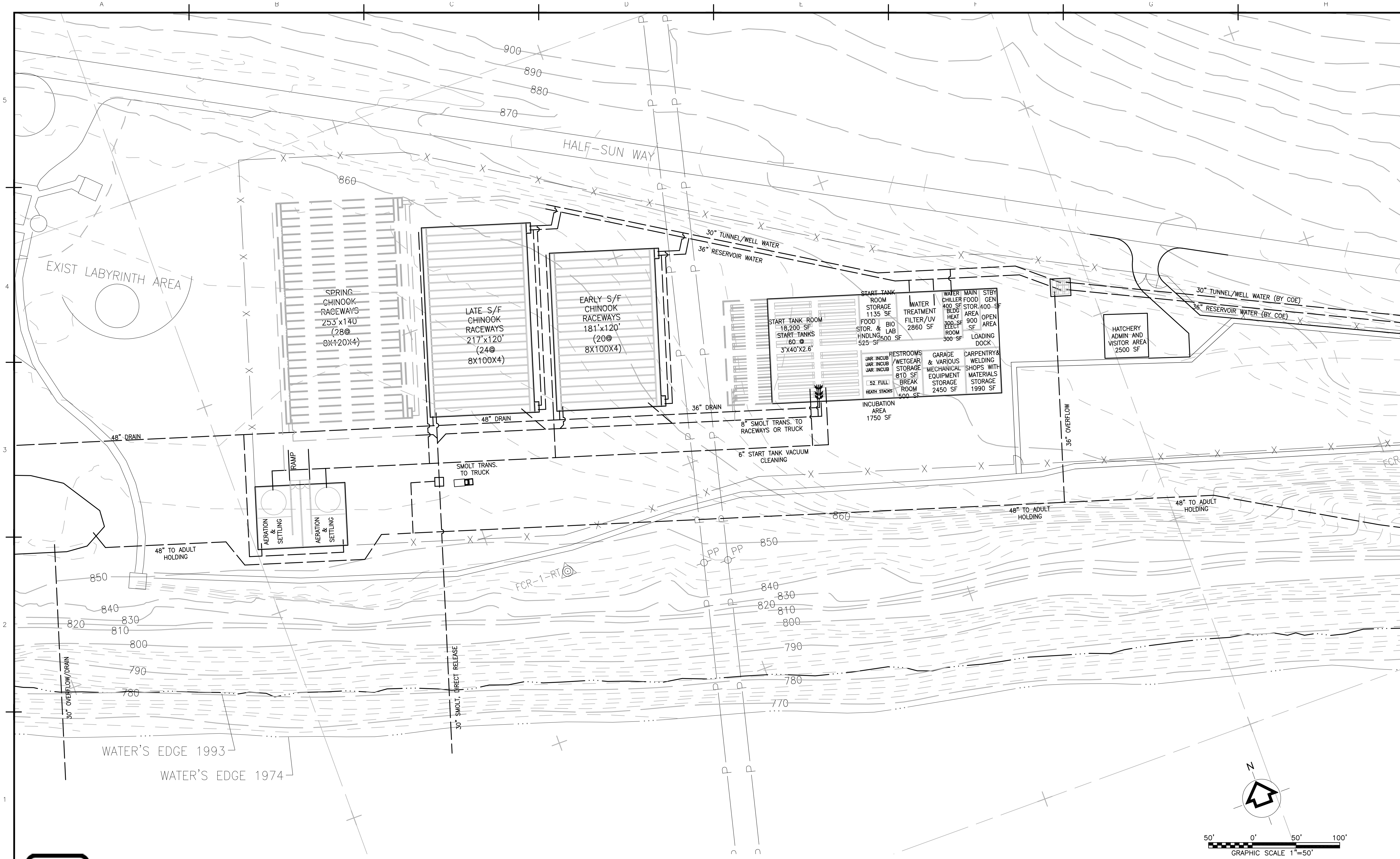

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FIGURE 30
HATCHERY SITE PLAN - ENLARGEMENT
RECEWAY AND HATCHERY BUILDING AREA

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"

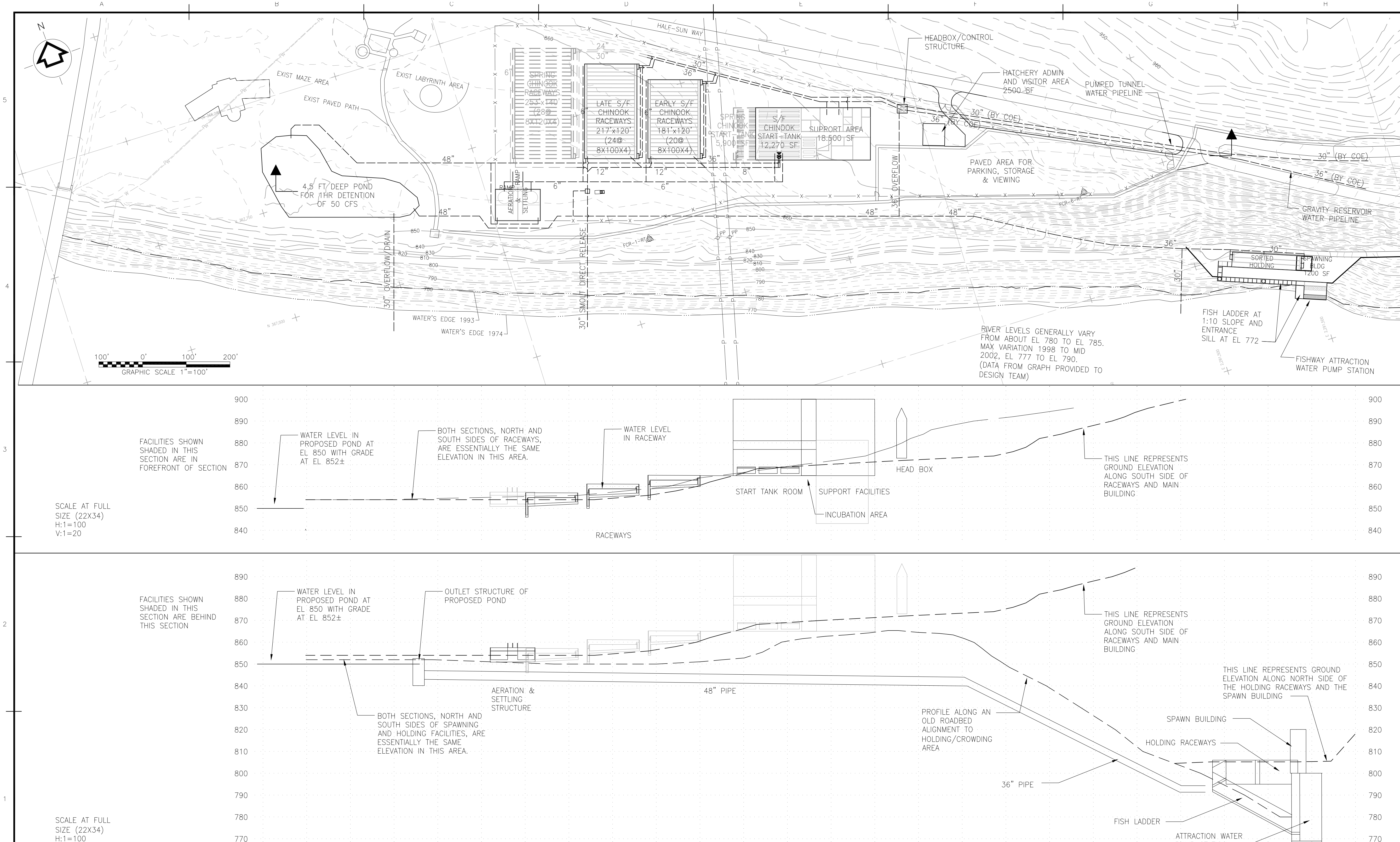

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FIGURE 31
HATCHERY AREA X-SECTIONS

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"

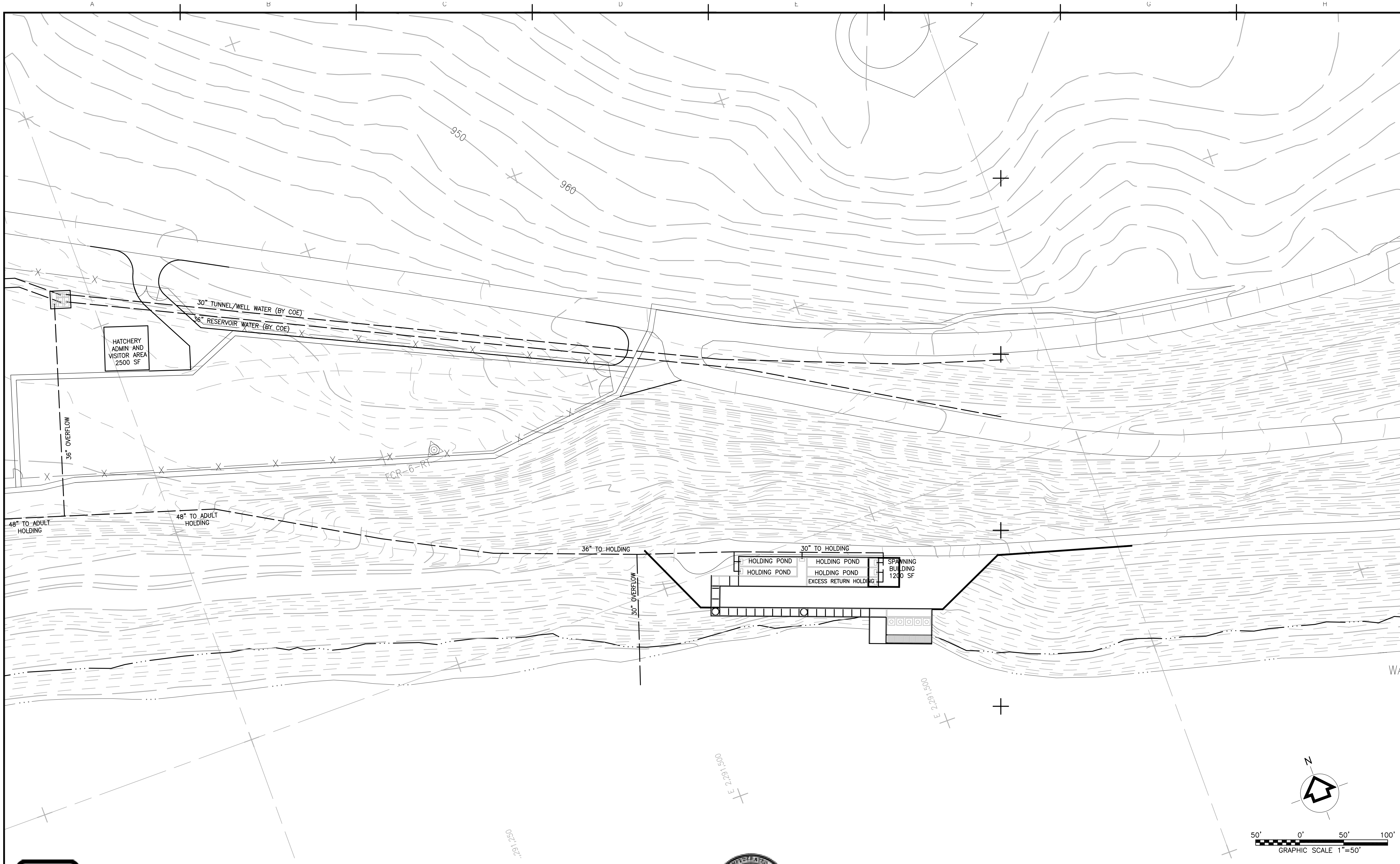

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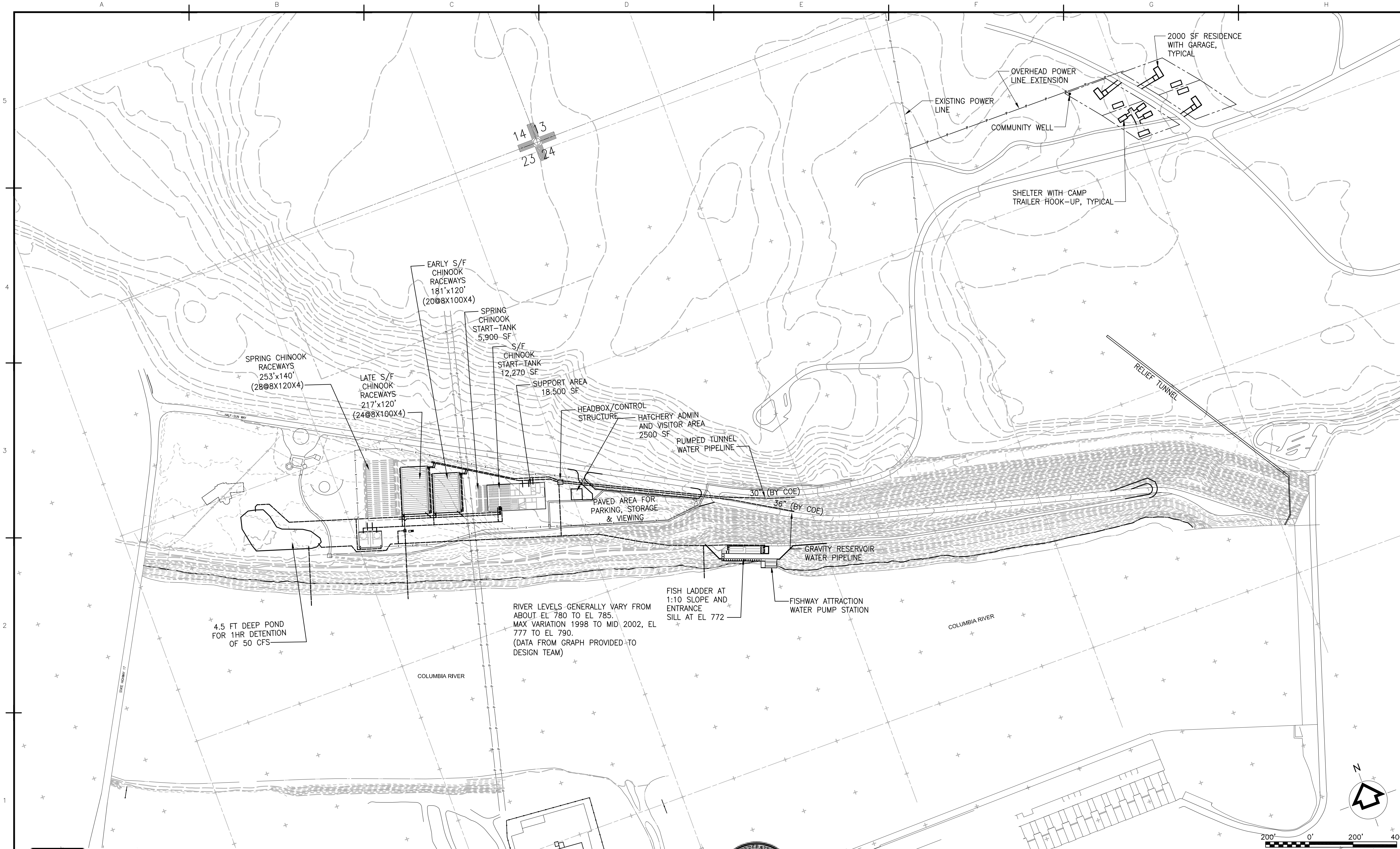
FIGURE 32
HATCHERY SITE PLAN - ENLARGEMENT
SPAWN AREA AND FISH LADDER

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"



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CONCEPTUAL DESIGN

FIGURE 33
HATCHERY AND HOUSING AREA
SITE PLAN

11.4 CHIEF JOSEPH DAM HATCHERY PROGRAM FACILITY OVERVIEW

11.4.1 HATCHERY SITE

The hatchery site, shown in Figure 29, is generally the plateau area along the right bank of the Columbia River between the Chief Joseph Dam and State Highway 17, extending northward to Half-Sun Way. At the west end of this 24.5-acre area is an existing COE visitor information and picnic area of about 13 acres. The area available for the hatchery development has a general slope from east to west, from elevation 900 feet to elevation 850 feet. The river bank drops from those elevations to the water's edge at about elevation 780 feet.

Vehicle access is provided by Half-Sun Way, which connects to SR-17 about 1,000 feet west of the site. The nearest city is Bridgeport, approximately 1 mile to the southwest across the river.

11.4.2 HATCHERY PLAN

The hatchery plan shown in Figure 30 uses the ground slope to provide as much gravity flow of water as possible. Hatchery cross-sections are shown in Figure 31. The headbox will be located at the site's upper elevation. It will receive water by gravity flow from Rufus Woods Lake above the Chief Joseph Dam and pumped water from the dam's relief tunnel (or a COE-developed well field). Both of those water supplies will be delivered to the headbox by the COE.

Adjacent to the headbox will be the hatchery building, which will contain the incubation area, a start tank room, and water treatment facilities as needed (it is anticipated that this will include a water chilling system for incubation water and drum filters and UV sterilization for treatment of Rufus Woods Lake water). The hatchery building will also contain support facilities such as a food storage room, maintenance shop, vehicle storage, associated storage room, a biological/pathology laboratory, crew restrooms and wet gear storage, crew break room, an electrical power room, a building heat/boiler room, a standby generator room and a general overhead storage area above the start tank room.

Downhill of the hatchery building will be groups of raceways, designed to receive fry by gravity from the start tank room. Each group of raceways will be a concrete structure with a common supply channel and a common drain channel. The common supply channel is anticipated to have multiple channel slots and to have both water sources supplied to each end. This will allow the supply channel to be divided into two segments of variable lengths so that each group of raceways can be used for two separate rearing programs of different temperature requirements. The process is designed for single pass flow with no re-use, although re-use capability could be installed for emergencies or other future needs.

Wastes vacuum cleaned from the start tank room and the raceways will be discharged to an aeration/settling structure located southwest of the raceways. This cleaning system will be operated by gravity. The aeration/settling structure will also receive the drum filter backwash. Normal rearing and drainage flows from the hatchery building and the raceways will go to a detention pond, bypassing the aeration/settling structure. This pond will be sized to provide one hour of detention at the facility's peak flow. Due to the slope and limited area of the hatchery site, the detention pond will be located west of the present COE visitor trail between the information/picnic area and the shoreline-viewing platform. This pond will be incorporated into a constructed wetland to shield the pond and to enhance the visitor experience.

Flow from the detention pond can be released directly to the Columbia River or be directed to the adult holding/spawning area, which will drain down the fish ladder to the river.

The adult holding and spawning facilities shown in Figure 32 will be located along the river bank about 900 feet east of the hatchery building and at an elevation of approximately 810 feet. This will place these facilities above the probable maximum river level while keeping the fish ladder reasonably short. It also will separate the adult/spawning facilities from the incubation and rearing facilities to provide better disease control. Vehicle access to these facilities, shown in Figure 33, will be from a paved road down to the face of the dam and along an existing gravel road that intersects the paved road at an acute angle. Improvements will be required on this access route to provide a flat bed/fish hauling truck turn-around at both the junction of the gravel road with the paved road and at the spawning facility.

A 2,000-square-foot administration and visitor facility will be located at the east end of the hatchery complex. Adjacent to this building will be an area that can be developed for significant parking, including visitor buses and motor home spaces.

Housing for some of the permanent staff, and camp trailer spaces for temporary staff will be provided in a location northeast of the hatchery as shown in Figure 33.

11.4.3 ACCLIMATION PONDS AND RELEASE SITES

In addition to the hatchery facility, the CJDHP will rely on four summer/fall Chinook acclimation sites (plus one contingency pond). These include two new acclimation ponds, and three existing acclimation ponds. The three existing ponds are Similkameen, Bonaparte, and a contingency pond, Tonasket Pond. The Similkameen Pond is operated by WDFW and will require no modifications. A typical design for the new acclimation ponds is shown in Figures 34 and 35. Some of the existing ponds will require modifications. A site plan of each acclimation pond is included with the full conceptual design report in Appendix G. The individual summer/fall Chinook sites that require new construction of modifications are described below.

11.4.4 GENERAL DESIGN REQUIREMENTS

The design or modification of the acclimation ponds will take into account icing issues. Experience gained from Washington Department of Fish and Wildlife (WDFW) operations at Similkameen Pond and the Colville Tribes' operations at Ellisforde and Bonaparte Ponds will be used to help guide design or necessary modifications. Design considerations will be given to pond intakes, outlets, and winter operational requirements.

New acclimation ponds supplied by river water will be designed to have their outlets downstream of the water supply intakes to avoid subjecting released fish to the intake screens. The Bonaparte and Tonasket ponds have telemetry systems with telephone links to the offices and cell phones of Irrigation District employees to warn of flow or surface level anomalies. Similar telemetry systems should be installed for all acclimation ponds to warn of potential flow, temperature, dissolved oxygen, and security anomalies.

All acclimation facilities will be fitted with netting and electrical fencing to prevent avian predation and entry of land-based predators.

Integration of rearing techniques similar to the NATURES system will be considered for the acclimation facilities. Consideration will also be given to adding structure and subsurface feeders to emulate natural conditions. The research on NATURES will be reviewed prior to final acclimation pond design to determine if survival advantages justify these types of facility additions.

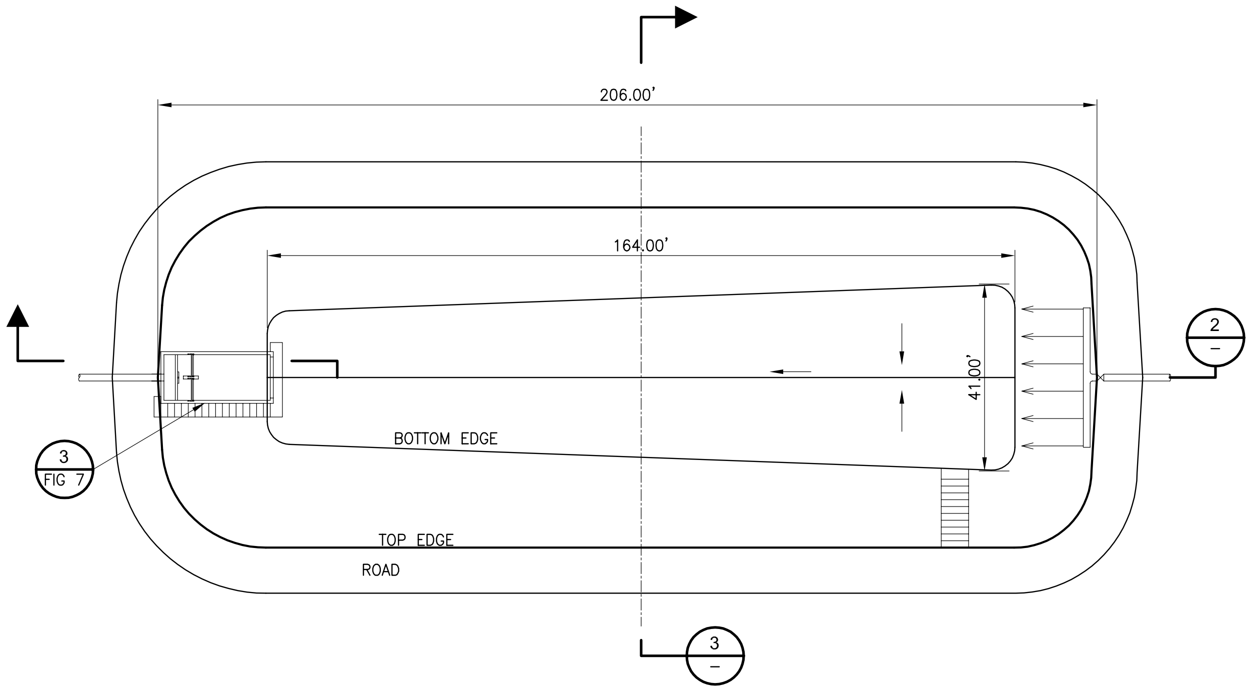
11.4.5 NEW ACCLIMATION PONDS

11.4.5.1 Riverside Pond

The Riverside Pond site is located on the left bank of the Okanogan River near river mile 49, approximately 7 miles downstream of the town of Tonasket. This pond will be constructed with a volume of 53,000 cubic feet and will be supplied with 20 cfs of water from the river. There is no existing pond at this site. Development of the pond will require construction of access, power, piping, a pump station, the pond, and a structure for volitional release of fish, predator protection, controls and telemetry. Consideration will be given to the addition of a pole-supported roof structure. The Riverside acclimation pond site is shown in Figure 36.

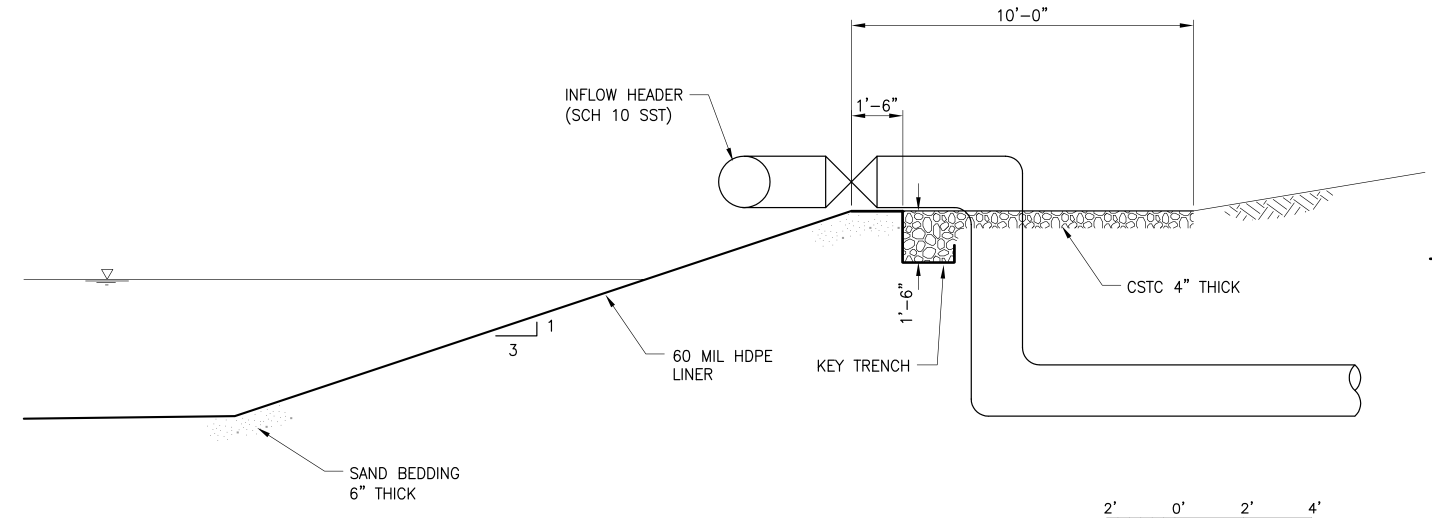
11.4.5.2 Omak Pond

The Omak Pond site is located on the left bank of the Okanogan River near river mile 32, in the town of Omak near the confluence of Omak Creek. The pond will be constructed with a volume of 53,000 cubic feet and supplied with 20 cfs of water from the river. Development of this new pond will require construction of a water supply system, the pond, site access, power, piping, a structure for volitional release of fish, predator protection, controls and telemetry. Consid-



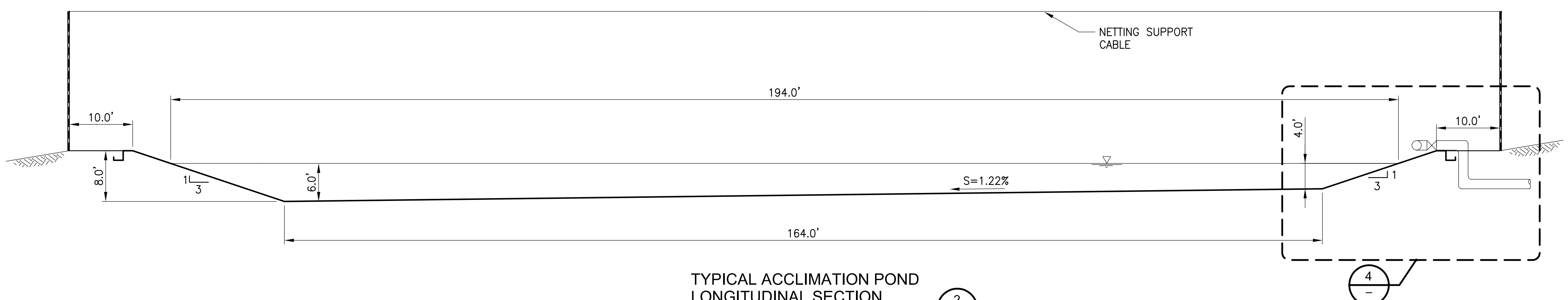
TYPICAL ACCLIMATION POND
PLAN VIEW
1" = 20'

GRAPHIC SCALE 1"=20'



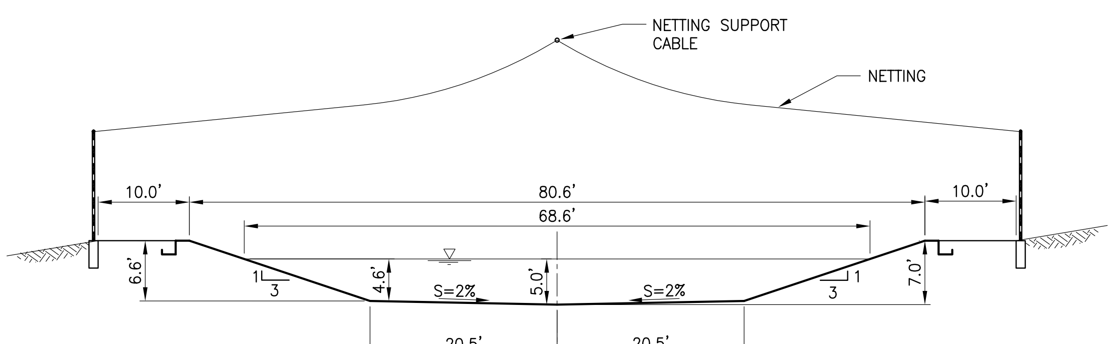
POND EDGE ENLARGEMENT
3/8" = 1'-0"

GRAPHIC SCALE 3/8"=1'-0"



TYPICAL ACCLIMATION POND
LONGITUDINAL SECTION
1" = 10'

GRAPHIC SCALE 1"=10'



TYPICAL ACCLIMATION POND
CROSS SECTION
1" = 10'

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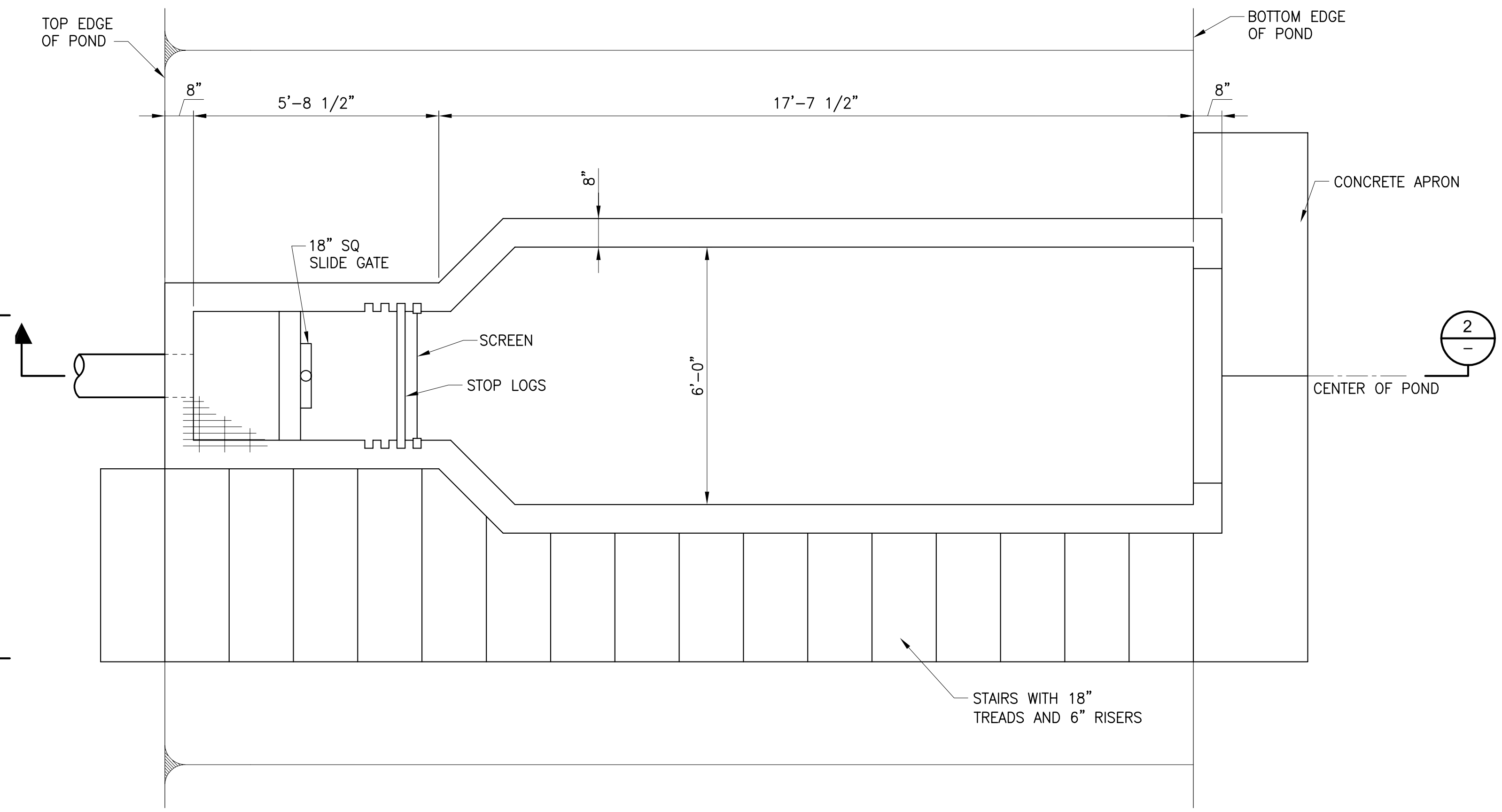
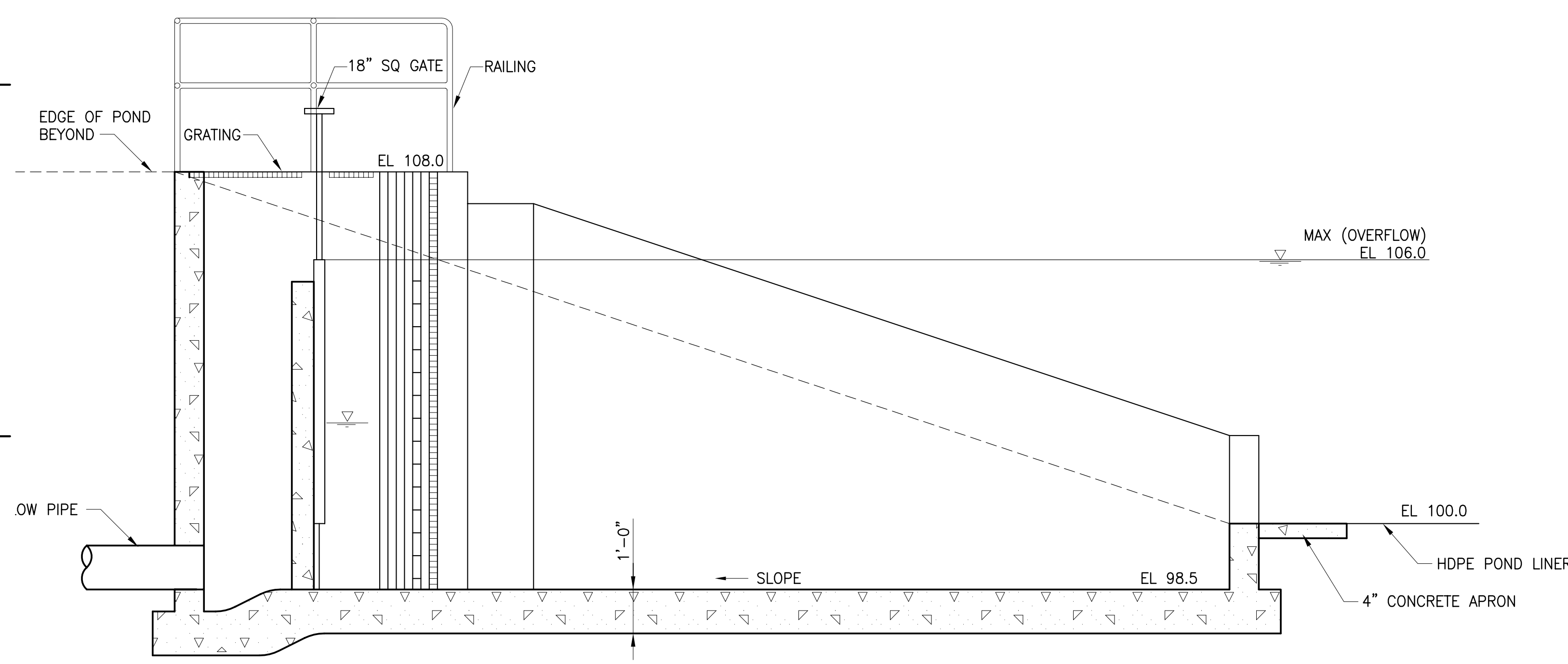
FIGURE 34
ACCLIMATION POND - 40,000 CF
TYPICAL PLAN AND SECTIONS

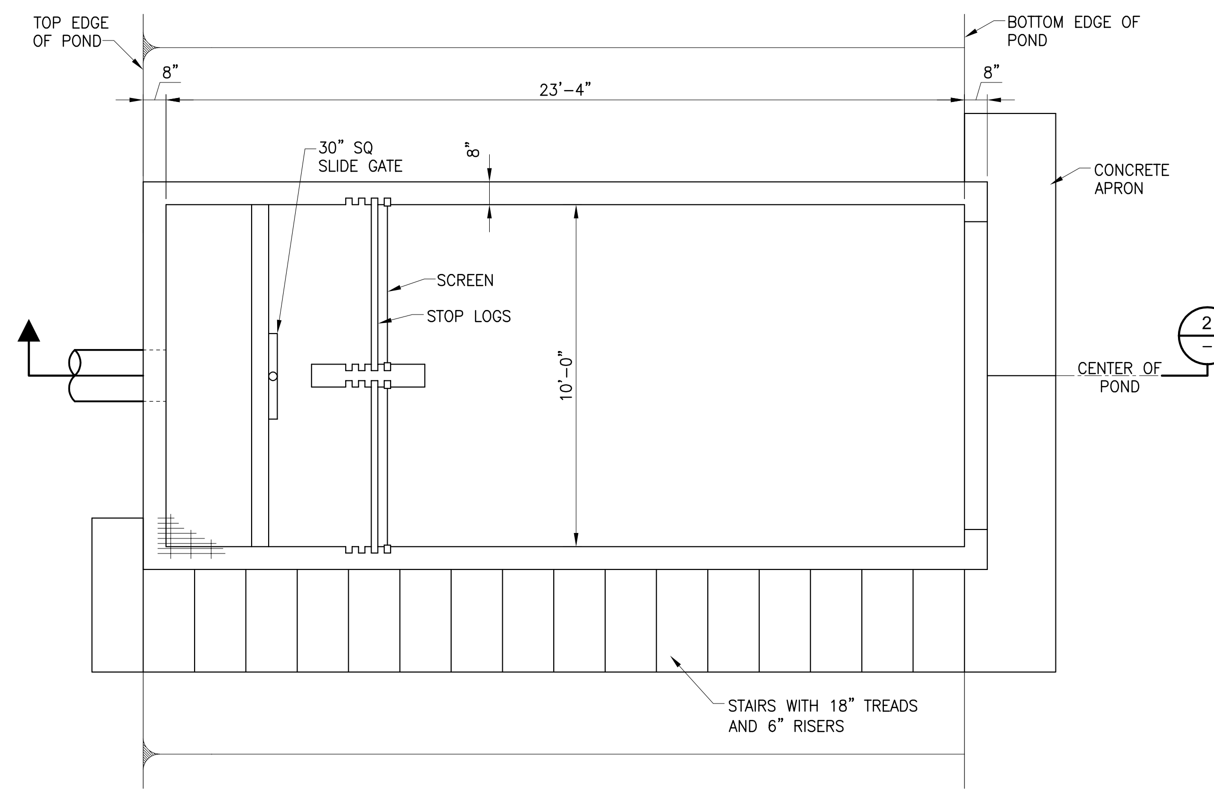


KETTLE PLAN VIEW (1)
1/2" = 1'-0"



1' 0' 2' 4'
GRAPHIC SCALE 1/2"=1'-0"

KETTLE SECTION (2)
1/2" = 1'-0"



KETTLE (HIGH FLOW) PLAN VIEW (3)
3/8" = 1'-0"

2' 0' 2' 4'
GRAPHIC SCALE 3/8"=1'-0"

ACCLIMATION POND OUTLET KETTLE
TYPICAL PLAN AND SECTION

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FIGURE 35
ACCLIMATION POND OUTLET KETTLE
TYPICAL PLAN AND SECTION

This drawing is full size when 22"x 34" or is reduced to half size when 11"x17"

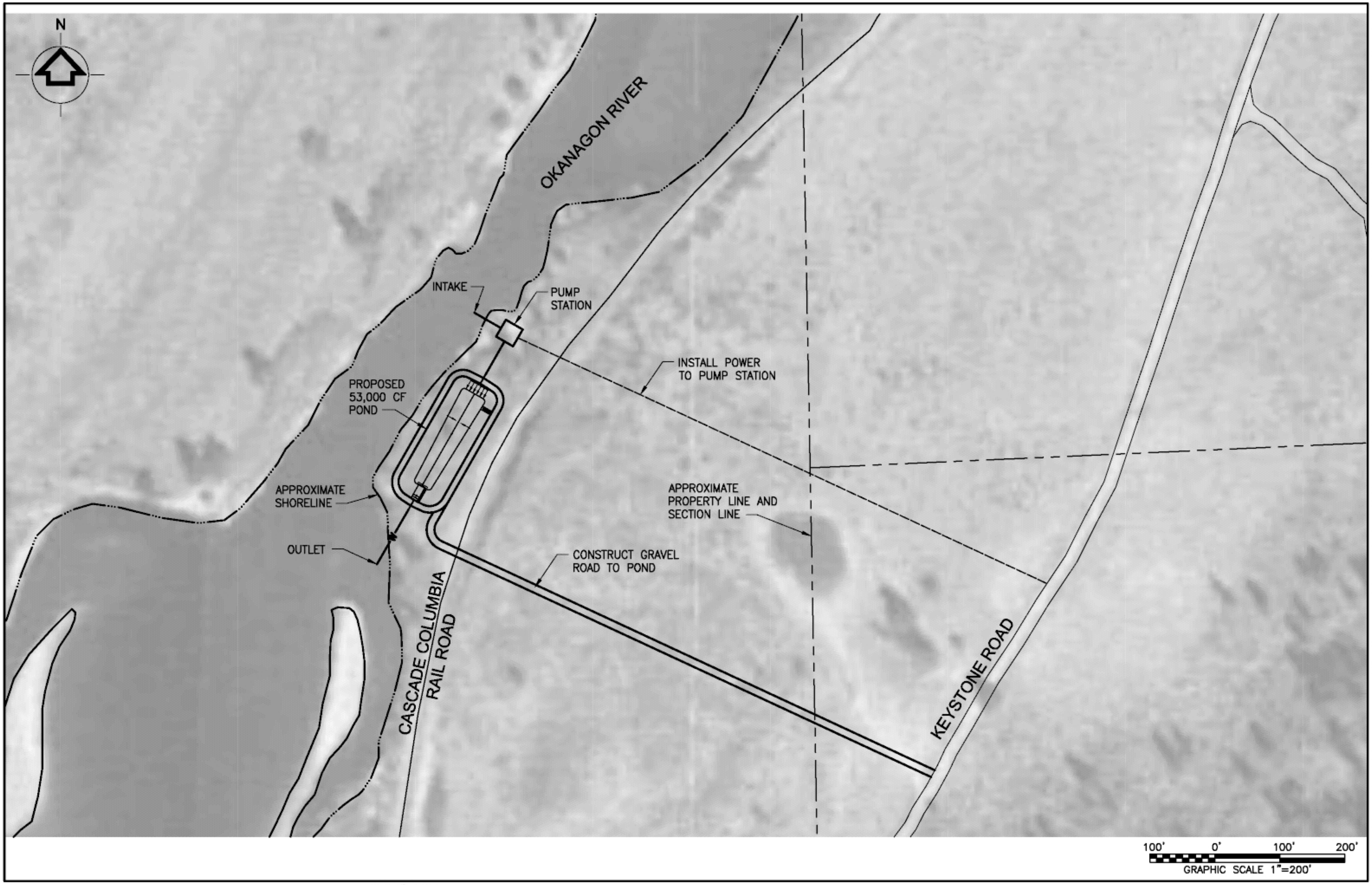

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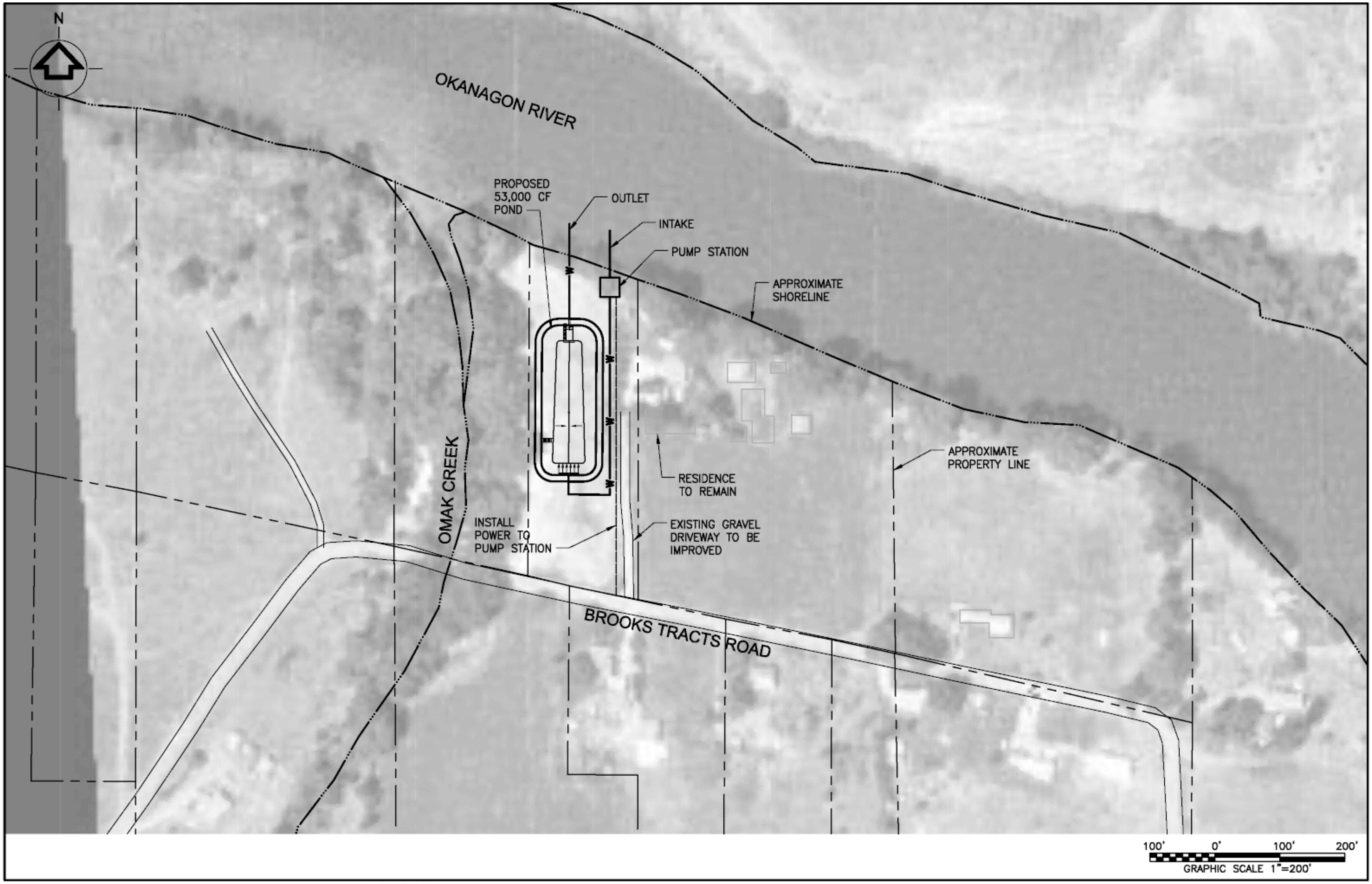
FIGURE 36
ACCLIMATION POND SITE PLAN
PROPOSED RIVERSIDE POND



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Colville Tribes CHIEF JOSEPH DAM HATCHERY CONCEPTUAL DESIGN	**FIGURE 37** ACCLIMATION POND SITE PLAN PROPOSED OMAK POND

eration will be given to the addition of a pole-supported roof structure. The Omak acclimation pond site is shown in Figure 37.

11.4.6 EXISTING ACCLIMATION PONDS

11.4.6.1 Tonasket Pond (Contingency Pond)

Tonasket Pond is on the right bank immediately upstream from the town of Tonasket. The pond is an open-air pond with a useable rearing volume of 74,300 cubic feet and is supplied with 25 cfs of water from the Okanogan River. The OTID owns and operates the pond for irrigation purposes. The pond is proposed to be a contingency pond for the summer/fall program should the Riverside Pond site not be available or construction not be feasible.

Improvements that will be required are modifications to inlet piping, enhanced access for operation and maintenance, installation of an outlet structure with modifications to outlet piping for volitional release of fish and for easier cleaning, and netting for predator protection. Consideration should also be given to enhancing the existing telemetry system to include monitoring and notification of desired fish rearing parameters to Chief Joseph Dam Hatchery staff when fish monitoring is needed.

11.4.6.2 Bonaparte Pond

Bonaparte Pond is located on the left bank immediately downstream from the town of Tonasket. The pond is an existing open-air pond supplied with 25 cfs of water from the Okanogan River, with a useable rearing volume of 65,300 cubic feet at an operating depth of 5 feet.

OTID owns and operates the pond for irrigation purposes. The pond has been modified for fish acclimation and no further modifications are required for rearing purposes. However, to improve ease of operation and maintenance, drainage and cleaning improvements may need to be considered. Consideration should also be given to enhancing the existing telemetry system to include monitoring and notification of rearing parameters to Chief Joseph Dam Hatchery staff when fish monitoring is needed.

11.4.7 RELEASE FROM THE CHIEF JOSEPH DAM HATCHERY SITE

Release of juvenile summer/fall Chinook from the Chief Joseph Dam Hatchery will be from the raceways through a pipe running directly from the raceway area to the river. The pipe can be either temporary or permanent.

11.5 HATCHERY SITE CONSIDERATIONS

11.5.1 POWER

Nespelem Valley Electric Cooperative currently has power lines crossing the site and supplying power to two irrigation pumps near the proposed hatchery facilities. This power source can be used to supply the hatchery. A new service, a transformer, and several hundred feet of power line will be required. Future power for the new project would be through 125kv/480v transformers, with further reduction transformers as required.

The cross-site power lines are about 50 feet above grade at the poles at the top of the river bank. The lines gain in elevation as they cross the site to the next set of poles on the top of the hillside (elevation 1,050 feet) north of Half-Sun Way. Existing power lines should not pose any insurmountable problems with the site planning. The original agreement between the COE and the power company, dated 1960 and expiring in 2010, appears to indicate that the COE could require the lines to be moved if needed, however the site plan is being developed with these lines remaining in place.

Consideration was given to using the dam electrical system as a source of power, but at this time the COE will not sell or provide power to the hatchery. The COE does not even supply station power to its own administrative facilities.

11.5.2 TELEPHONE

Telephone service is available at the existing visitor center approximately 1,000 feet west along Half-Sun Way. Service will have to be extended along Half-Sun Way to the hatchery.

11.5.3 SANITARY SEWER

The nearby COE Visitor Orientation Center has an on-site sewer system that cannot be expanded for use by the hatchery. Development of the hatchery and support facilities at this site will require construction of an on-site sanitary wastewater system or a force main across the SR-17 bridge to connect to the Bridgeport sewage system. The City of Bridgeport has indicated that its sanitary sewer system is at 80% capacity and the EPA has imposed a moratorium on sewer connections until a sewer capacity study is performed. Further analysis and design of a sanitary sewer system for the hatchery will be required in Step 2 of the Council's three-step process.

11.6 CHIEF JOSEPH DAM HATCHERY FACILITY COMPONENTS

11.6.1 FISH-REARING WATER SUPPLY

It is planned that fish-rearing water will be supplied from the Rufus Woods Lake and the dam's north embankment relief tunnel. Both of these water supplies will be delivered to the hatchery headbox by the COE. A hatchery flow schematic, provided in Figure 38, shows the distribution of water through the facilities. The relief tunnel water may need to be augmented by additional well development if that source is not able to produce 20 cfs.

The bioengineering model used historical water temperatures given for these two sources and calculated the quantities needed from each source to meet fish biological needs at proposed design temperatures. When the proposed water temperature was between the two source temperatures, the model calculated how much of each source would be blended to meet the fish requirements at the proposed temperature.

11.6.2 RUFUS WOODS LAKE

The bioengineering model showed that the maximum Rufus Woods Lake flow needed to rear the summer/fall Chinook programs is 22 cfs, based upon fish biological needs. It is assumed that Rufus Woods Lake water will need to pass through water treatment facilities, as it is subject to possible disease pathogens and waterborne contaminants from up-reservoir sources. This treatment is anticipated to be sand filtration and ultraviolet light exposure.

The intake for the hatchery supply may include a multiport intake at different levels within the reservoir so that a selection of temperatures or water quality may be drawn off for hatchery use.
With the proposed spring Chinook program, the maximum Rufus Woods Lake supply requirements would increase to 44 cfs, based upon fish biological needs.

The COE has indicated that it will be able to release as much Rufus Woods Lake water as needed to meet the program requirements.

11.6.3 RELIEF TUNNEL

The bioengineering model showed that the maximum relief tunnel flow needed to rear the summer/fall Chinook programs is 24.5 cfs, based on fish biological needs. The peak flow for relief tunnel water would be required in the first week of November when there is a need for a large quantity of this cool source of water to offset the high Rufus Woods Lake water temperatures. In addition, 1.1 cfs of this flow is needed for the incubation of eggs. It is proposed that the incubation process use relief tunnel water because of its higher water quality and more suitable temperature.

The COE has stated that it will develop a means of supplying a minimum of 20 cfs of relief tunnel water to the hatchery headbox, which may be up to 4.5 cfs less than what the model shows to be needed. The time period when more than 20 cfs is needed is estimated to be the last three weeks of October. The difference between program needs and the available supply may be reduced or eliminated by a combination of the following: changes in the rearing programs (such as reduced numbers or change of release size); earlier transfer to acclimation ponds; refinement of calcula-

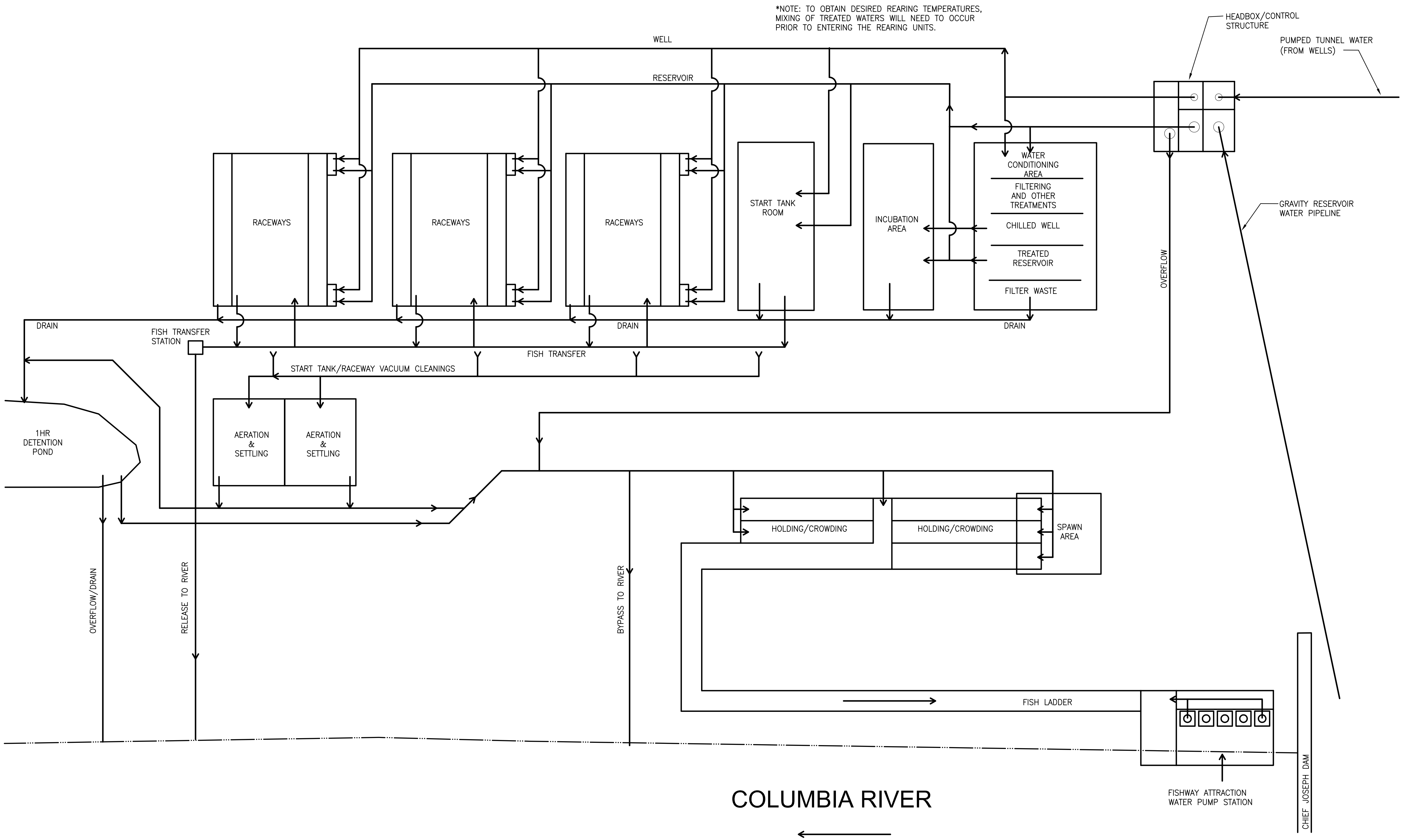

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FIGURE 38
HATCHERY FLOW SCHEMATIC

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tions or development of an additional well water source.

11.7 INCUBATION AND START TANK ROOMS

11.7.1 INCUBATION ROOMS

This portion of the main hatchery building will include two rooms. The first room will be a jar incubation area where jars (of various sizes if needed) will be filled with eggs and agitated with sufficient upwelling water to gently suspend and circulate them until they are transferred to the vertical tray incubators. Due to the constant motion of the eggs, initial incubation in jars reduces fungal growth that can be spread from dead eggs to live eggs. This provides for single-family incubation.

The second room will contain the vertical tray incubators. The room will be sized for 52 full stacks (16 trays each) of incubators. The summer/fall Chinook programs require 35.5 full stacks of incubators. The spring Chinook programs require 16.5 full stacks of incubators.

11.7.2 START TANK ROOM

After the eggs hatch and the fry develop to the button-up stage, they will be distributed to the start tanks in the start tank room. The start tanks will be units 3 feet wide by 40 feet long operating at an average depth of 2.5 feet. Forty units will be required for the summer/fall Chinook programs and an additional 20 start tanks will be needed for the spring Chinook programs. The tanks will be mounted in pairs (back to back) with access for feeding, cleaning and inspection from one side only. The downstream end of the start tanks will have a short portion screened off to contain the fish in the tanks. A second outlet from each tank will be used to transfer the fish to the raceways. Feeding of fry in the start tanks will be by hand. A room adjacent to the start tank room will be designated as a start tank feed storage room where feed from the bulk feed storage room will be proportioned and mixed.

A second room adjacent to the start tank room will be a storage room for equipment normally used only in the start tank room, such as tank screens, scales, buckets, etc.

11.7.3 OUTDOOR RACEWAYS

The groups of outdoor raceways will be constructed of concrete with uniformly sloped bottoms. The head end of each group of raceways will have a head channel with mixing boxes at each end to allow two separate water temperatures to be developed in the head channel (separated by drop-in stop gates). Both Rufus Woods Lake water and relief tunnel water is to be supplied to each of the mixing boxes, with separate control valves to facilitate the mixing.

The details of raceway screens and baffles will be determined during subsequent design phases. It is anticipated that each raceway will have screens to prevent fish from entering the inlet and outlet channels, as well as screen and baffle guides throughout to allow for isolating raceway segments and inducing scouring currents to move sediment.

At the downstream end of each group of raceways will be a common drain channel that receives all normal rearing water flows after they have passed through the raceways. This flow will be directed to a detention pond. Upstream of the common drain channel, flow from the rearing area of the raceway will pass through a screened area where plugged outlets to the fish transfer piping and to the cleaning waste piping will be located. When these outlets are plugged, the water will overflow a weir into the drain channel. The weir will be used to establish and maintain the normal rearing depth of each raceway. Fish can be released from the raceway either by pumping (using fish pumps) or gravity draining through the fish transfer outlet mentioned above. The cleaning waste outlet will be piped to the aeration/settling structure and will be used for vacuum cleaning of the raceway. Not all raceways will need a cleaning waste outlet, as the hose used for vacuum cleaning can span several raceways.

It is anticipated that the fish in each raceway will be fed using a combination of hand feeding and demand feeders. Hand feeding is anticipated to be more prevalent during the early raceway-rearing period, with augmentation feeding from two demand feeders per raceway in the later rearing period.

The summer/fall Chinook raceways will be 8 feet wide, with a rearing length of 100 feet and an average depth of 3.25 feet, resulting in an individual raceway rearing volume of 2,600 cubic feet. The bioengineering model indicates that the early summer/fall Chinook programs will require about 20 raceways of this size and the late summer/fall Chinook programs will require about 24 raceways. (The spring Chinook program would require 28 additional raceways that are 8-feet wide, 120-feet long, and 4-feet deep [see Chapter 13 for additional detail on spring Chinook components.])

11.8 SUPPORT FACILITIES

11.8.1 WATER TREATMENT

Water quality data available for the two proposed water sources shows that the proposed rearing programs appear to be feasible by using one source or the other, or a mix of the two to obtain the growth desired after the eggs have hatched. However, analysis of the production programs demonstrates a need to chill relief tunnel water for incubation. The analysis shows an incubation temperature of 48°F from the beginning of October to the end of April. During this seven-month period the relief tunnel temperature data varies from about 49.5°F to 55.5°F.

It is possible chilling of a 500 gpm incubation flow for the summer/fall programs may require a 200-ton chiller and associated chilling tower. It may be possible to reduce chilling costs by cooling the relief tunnel water with a heat exchanger and Rufus Woods Lake water during portions of the incubation period.

The Rufus Woods Lake water may need sand filtration and ultraviolet purification due to contamination from human or natural sources or from up-reservoir water uses such as the existing net pen fisheries operations. Based on the biological needs of the various programs, the sand filtration/UV system should be designed to treat 22 cfs for the summer/fall Chinook.

11.8.2 FOOD STORAGE AND HANDLING

At the east end of the hatchery building will be the main food storage area. It will have a capacity to store the maximum amount of food required in an eight-week period plus a one-week overlap for delivery schedule. There will also be a room for sorting pallets of different-sized feeds. Food refrigeration will be provided through use of existing facilities at the Colville Trout Hatchery.

An estimate of 67,200 pounds of feed will be consumed during the peak eight-week period. At 40 pounds per cubic feet, this requires a storage volume of 1,670 cubic feet. With pallets of feed being 4 feet high, the space required for feed storage would be about 400 square feet. With an allowance for pallet maneuvering, an area for empty pallets and bags and an area for bucket loading, the total area could be twice that of the palletized feed storage area. An area of 900 square feet is shown for the main food storage area. A second food storage area will be provided adjacent to the start tank room where finer starter feeds will be prepared for delivery to the start tank room.

11.8.3 BIOLOGICAL LABORATORY

A small laboratory, to be used for all on-site biological and rearing water analysis, will be located between the start tank room and the water treatment room. This laboratory area will provide space for storage of all chemicals and equipment needed to perform the various tests and analysis desired by the hatchery staff.

11.8.4 SHOPS, GARAGE/EQUIPMENT STORAGE AND LOADING DOCK

The southeast portion of the hatchery building will contain areas for storage up to four vehicles and other mechanical equipment (shown as 2,450 square feet), an area to be divided into a carpentry shop and a separate welding shop (shown as 1,990 square feet), a loading dock, a standby generator room and an open air covered storage area. Upon further study, these and other areas of the building may be redesigned to reduce or optimize the size and shape of the overall building.

11.8.5 CREW AREAS

Crew accommodations will include a break/lunch/meeting room, a pair of restrooms with showers and lockers, and a wet gear storage area.

11.9 FISH TRANSFER AND OUTMIGRATION FACILITY

11.9.1 FISH TAGGING/CLIPPING

The Colville Tribes presently own a portable trailer containing several coded wire tagging machines. There are plans to update the trailer with the purchase of additional tagging machines and revamping of the equipment layout.

Fin clipping is planned to be a manual operation requiring several crews to process all of the fish being reared at this facility, whether released directly from the Chief Joseph Dam Hatchery or from the acclimation ponds along the Okanogan River.

Both fin clipping and tagging will be conducted with portable trailers, so no permanent facilities are shown on the site plans or included in the facility construction cost estimate.

11.9.2 FISH TRANSFER FACILITIES

With the hatchery building floor level being above the water level of the rearing raceways, the transfer of fish from the start tanks to the raceways is anticipated to be a gravity process through either portable or permanently installed piping. The fish transfer truck loading station will be located low enough to receive fish from the raceways by gravity.

11.9.3 ON-SITE RELEASE

Fish to be released directly from the Chief Joseph Dam Hatchery site will be drained through the truck loading station to the river in a pipe system that will be too steep for fish to swim up.

11.9.4 ADULT FISH ATTRACTION AND FISH LADDER

The location shown for these facilities is tentative. The Colville Tribes are presently undertaking a study to establish the best location for the fish ladder entrance.

11.9.5 ATTRACTION WATER SOURCES

The fish ladder attraction water supply will be separate from the fish-rearing water supply. Due to the high flows that may be released through the power generating turbines on the left bank of the river or released over the spillway, a fairly large quantity of water may need to be released from the fish ladder to attract adult fish to that structure. The quantity of fish ladder release flow for attraction purposes has been estimated at 500 cfs. This quantity of flow is available from two sources, either the Rufus Woods Lake reservoir (gravity) or the Chief Joseph Dam tailrace pool (pumped). The COE is not likely to release this flow from the reservoir as this water can produce more power going through the turbines than the power required to pump this amount from the tailrace.

Attraction water will therefore be provided from an adjacent pump station using up to five 200-hp pumps to discharge the 500 cfs into the ladder entrance. The discharge will use upwelling through a bottom grate in the fish ladder entry section to reduce fish disorientation to the flow coming down the ladder.

11.9.6 FISH LADDER DESIGN

The fish ladder is proposed to be similar in design to the ladder constructed at the Ice Harbor Dam, except that this ladder will only be a "half structure," being about one-half as wide and having one ladder weir and orifice opening per ladder step. Each ladder step will rise at a rate of one foot per 10 feet of length from the ladder sill entrance elevation.

The ladder sill elevation is proposed to be at elevation 772 feet, based on a minimum water depth in the ladder of 5 feet and the minimum tailrace elevation during the period of 1998 to mid 2002 of 777 feet.

The ladder will run parallel to the river and rise to a bottom elevation of 790 feet before turning 90 degrees and rising an additional 3 feet, at which point it will again turn 90 degrees to again run parallel to the river at a minimum distance of 20 feet from the first ladder section. The ladder will continue to rise to a bottom elevation of 795 feet where it will change into the main holding/crowding channel. Water flowing down the ladder will originate at the upstream end of the various holding ponds that will come together in the main holding/crowding channel.

11.9.7 ADULT FISH HOLDING/ CROWDING/SORTING AREAS

The bioengineering model shows that the minimum holding volume for the summer/fall Chinook would be about 9,700 cubic feet. Water will be supplied through an upwelling sump at the head end of each holding/ crowding/sorting raceway. This water will be supplied from the detention pond and any excess (overflow) water draining from the headbox.

These facilities are shown adjacent to an existing single lane road at an elevation of about 805 feet, which is about 15 feet above the maximum tailrace elevation recorded during the 1998 to mid-2002 period. The main holding/crowding channel, at the end of the fish ladder, will extend to a location where it is adjacent to five holding/sorting raceways. The number and configuration of raceways may change during subsequent design, but the five raceways shown can be used as follows: two for early summer/fall Chinook, two for late summer/fall Chinook, and one for excess returning fish and to acclimate broodstock coming from remote sites with 10 degree to 15 degree warmer water. Most of this summer/fall broodstock will be trucked in from remote collection sites. (The late summer/fall Chinook raceways can also be used for spring Chinook earlier in the year should that program be implemented.)

Each of the holding/crowding/sorting raceways is 10 feet wide and 65 to 80 feet long. With a holding depth of 5 feet, these raceways, including the distribution channel, provide a total volume of about 23,000 cubic feet. It is anticipated that the holding depth would be lowered during crowding and sorting to allow crews in the holding raceways to select and handle the fish.

11.9.8 SPAWNING AND EGG-TAKE FACILITIES

The spawning and egg-take facilities shown in Figure 31 include a 1,200-square-foot enclosed structure that overlaps the east end of three of the holding/sorting raceways by 10 feet to allow easy access to the crowded fish during the spawning process. Carcasses resulting from the spawning operation will be stored adjacent to the spawn building in covered totes until transported off-site. The carcass storage area can also be used as a harvest area or a transfer area for excess returning fish.

For the proposed egg-takes, the volume of fish to be spawned is not excessive (less than 200 per week). However, use of a live fish lift such as a "pescalator" may result in improved handling efficiency of these fish as well as allow for moving large numbers of excess adult returns. A portable unit that can be moved from raceway to raceway would provide the greatest flexibility.

Spawned eggs will be briefly stored in buckets or other containers within the structure until transported to the incubation room of the hatchery building.

11.10 EFFLUENT TREATMENT FACILITIES

11.10.1 EFFLUENT QUALITY REQUIREMENTS

Discharge from the Chief Joseph Dam Hatchery site to the Columbia River must meet the requirements of the Washington State Administrative Code (WAC) Section 173-221A.

Under the requirements in the WAC, an off-line treatment process of vacuumed start tank or raceway cleaning wastes must meet the following:

- Total suspended solids–Average monthly removal of 85 percent.
- Settleable solids–Average monthly removal of 90 percent.
- Instantaneous maximum total suspended solids concentration–Not in excess of 100 milligrams per liter of effluent.

- Instantaneous maximum settleable solids concentration in the off-line settling basin effluent–not in excess of 1.0 milliliter per liter of effluent.
- Flows that pass through the normal hatchery flow path (over start tank and raceway water level control weirs or stand pipes) must meet the following:
- The instantaneous maximum total suspended solids concentration in the effluent at the point of discharge to the receiving environment shall not exceed 15 milligrams per liter of effluent.
- The average total suspended solids concentration in the effluent at the point of discharge to the receiving environment shall not exceed 5 milligrams per liter of effluent.
- The average settleable solids concentration in the effluent at the point of discharge to the receiving environment shall not exceed 0.1 milliliter per liter of effluent.
- Effluent limitations shall apply as net values, provided the criteria contained in 40 CFR 122.45 (net gross allowance) are met.

11.10.2 AERATION AND SETTLING FACILITY

The aeration and settling facility will be a concrete structure near the downstream end of the spring Chinook group of raceways. This offline facility will receive the vacuum cleanings from the start tanks and raceways at a rate of less than 50 gpm. The structure will be split into two sections, each having a floating aerator and a ramp entry for access to remove solids (sludge). Supernatant from the settling process can be drained to either the detention pond or directly to the outfall pipe. Drain-down for solids removal will be drained to the detention pond.

FIGURE 39: Photo at General Location of Chief Joseph Dam Hatchery

11.10.3 DETENTION POND

A 1989 report by the Washington State Department of Ecology recommended that "whole effluent should be allowed to settle at least one-hour before discharge" where whole effluent would include the vacuum cleaning wastes. Although this conceptual design includes offline treatment of cleaning wastes as indicated above, a detention pond providing 1 hour of detention at a peak flow of 50 cfs should still be planned for. The detention pond will be lined with a plastic liner covered with suitable soil to maintain wetland plants.

11.11 ADMINISTRATION AND VISITOR AREAS

11.11.1 ADMINISTRATION BUILDING

The COE previously performed a study to locate a new visitor center building within the area now designated for the hatchery. One option developed for the Chief Joseph Dam Hatchery conceptual design combined this future COE facility with the hatchery administration and visitor building in a two-story, 12,500-square-foot building, but that option was not carried forward. Instead, a 2,000-square-foot administration and visitor facility for the Chief Joseph Dam Hatchery will be located at the east end of the hatchery complex.

It will contain the following spaces:

- Offices (Two @ 120 square feet) .... 240 SF
- Lobby/Display Area .... 576 SF
- Conference Room .... 480 SF
- Dry Storage .... 144 SF
- Wet Gear Lockers .... 160 SF
- Restroom .... 100 SF
- Janitor Closet .... 64 SF
- General Circulation @ 12% of space .... 212 SF

Total 1,976 SF

11.11.2 SITE ACCESS AND PARKING

Two site entry points are planned for the main hatchery area and a third entry point needs to be developed to access the proposed adult holding and spawning facilities.

Adjacent to the administration and visitor building will be an area that can be developed for significant parking, including visitor buses and motor home spaces. This area can also be used for miscellaneous covered storage. The two entry points off Half-Sun Way will provide multiple entries into this area. These entry points presently allow a circular path for large trucks, buses and private motor homes, with no backing up required.

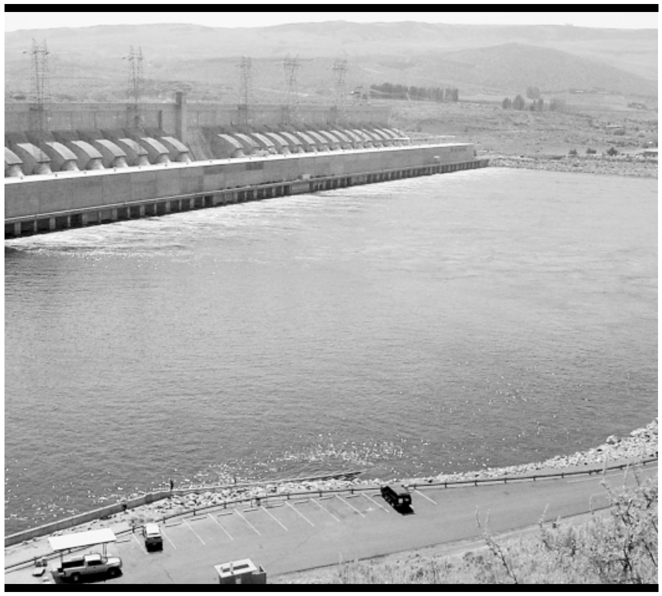

FIGURE 40: Photo Looking Down at Current Parking Facility at Chief Joseph Dam

Access to the adult holding and spawning facilities, by single-axle flat bed trucks for carcass tote hauling, adult fish transport trucks, and various vehicles needed to service the attraction water pumping station, will require that a new turn-around be developed at the junction of the COE's road to the face of the dam and the gravel service road to this area. The new turn-around will probably require a short wall to retain the uphill slope.

At the adult holding and spawning facilities, vehicle access will be developed so that the single axle flat bed truck and adult fish transport trucks can loop around the complex by driving across the short section of the ladder that is oriented perpendicular to the river. Vehicles servicing the attraction water pumping station will also use this access loop.

11.11.3 COE TRAIL

About 700 linear feet of the existing asphalt walking trail will be relocated southward to stay along the edge of the river bank. This relocation will allow a larger area to be developed for the large vehicle travel loop and the parking area associated with staff and visitor needs. A chain link fence surrounds the project area and parallels a major portion of the trail along the river bank.

11.12 STAFF HOUSING

11.12.1 LOCATION

Several locations for hatchery staff housing were reviewed. COE staff indicated that residential housing at the hatchery site is not compatible with COE land use requirements. A location that is approximately 0.8 miles to the northeast on Half-Sun Way was selected and is proposed for hatchery staff housing. The location, shown in Figure 33, is uphill from the hatchery on the upper bench at an elevation of 1,050 feet.

At the housing site, extension of power and telephone from overhead lines approximately 1,000 feet away will be required. The exact location of power and telephone has not been verified. Water and sewer service will require development of a common well and on-site septic systems. Figure 33 is a site plan of the hatchery staff housing site.

Three permanent residences are proposed. Each residence will be 2,000 square feet, with a two-car attached garage. The lot size for each residence will be about 1 acre. In addition, a one-acre parcel will be used for temporary housing for three covered camp trailer sites with utility hookups.

11.13 ALTERNATIVES CONSIDERED IN DEVELOPMENT OF CONCEPTUAL DESIGN

The Colville Tribes, the COE, and consultant Tetra Tech/KCM, Inc developed the conceptual design for the Chief Joseph Dam Hatchery collaboratively. The process included the consideration of several alternatives that were identified and fleshed out during site visits and review meetings.

Bill Towey

FIGURE 41: Photo Vicinity of Proposed Chief Joseph Dam Hatchery Site

Discussion was devoted to the problems associated with developing a conceptual plan for summer/fall Chinook, while also attempting to provide the necessary information for separable spring Chinook facilities.

The following sections describe some of the alternatives and concerns that were broached in the development of the Step 1 conceptual plan.

11.13.1 HATCHERY FACILITY LOCATION

In development of the initial hatchery site plans, three issues posed recurrent challenges: 1) the location of the hatchery relative to cross-site power lines, 2) the location of resident housing related to the hatchery facility, and 3) the size and location of a possible visitor center.

11.13.1.1 General Site Issues

Based on information provided in the request for proposal for the hatchery, a pre-bid site visit and various communications, two site plans were developed for the Steering and Design Committee Meeting in January 2004. The initial plan located all of the hatchery facilities, except the water supply headworks and the fish ladder entrance, at the west end of the hatchery site, in the widest and flattest portion of the plateau. This plan incorporated a portion of the existing COE visitor information area into the general public entry to the hatchery site. The second plan placed all of the facilities, except the aeration/settling structures and the detention ponds, east of the cross-site power lines. Both of these plans located the hatchery resident housing on the hillside north of Half-Sun Way.

Tetra Tech/KCM was advised to plan the placement of as many of the hatchery facilities as possible east of the cross-site power lines. The placement of the hatchery facilities relative to the power lines, and in deference to requests from the COE (see below), had impacted the possible layout of raceways, holding ponds, visitor and other facilities.

11.13.1.2 Visitor Center

At the first Steering and Design Committee Meeting in January, COE personnel mentioned that a previous visitor center study determined that the best site for a visitor facility was near the center of the western end of the lower plateau.

At a tour of the site in early February of 2004, much of the site visit discussion revolved around the location of the planned COE visitor center, the views of the dam, maintaining the existing visitor information area facilities, and proposed facility relationships. Two optional site plans were presented to the Colville Tribes at the February Steering and Design Committee meeting. The two plans differed mainly in the size and location of the administration and visitor building. In the first option the administration and visitor building was 2,500 square feet and located adjacent to one of the site entry points. This building contained a general visitor information/reception area sized for occupancy by about 35 people. This option had the proposed COE visitor center at the planned location near the existing maze and visitor information facilities. In the second option, the hatchery's administration and visitor building was a two-story facility with a total floor area of 12,500 square feet. The 12,500-square-foot building combined the proposed COE visitor center with the hatchery administration and visitor building. This combined building was shown close to the river bank and atop a portion of the fish ladder, with basement level side-window observation into the fish ladder.

However, neither of these proposed plans could be developed with all of the hatchery facilities east of the cross-site power lines due to the eastward narrowing of the site and the westward drop in grade. The plans showed the hatchery building and administration/ visitor building east of the power lines, and the rearing raceways, aeration and settling structure, detention pond, holding and sorting area, and spawn house all west of the power lines. Both of these plans also showed the residences on the hillside, adjacent to a second COE visitor viewing area.

11.13.1.3 Hatchery Residences

At the first Steering and Design Committee Meeting in January, upon review of the initial site plans, the COE expressed a preference to have the resident housing located at the existing Colville Tribes' trout hatchery site, about 3 miles west of the proposed Chief Joseph Dam Hatchery site.

During a site visit in February of 2004, it was agreed that the residences would be located somewhere on top of the hill north of the Chief Joseph Dam, with the exact location undetermined. At the Steering and Design Committee Meeting in February, the COE indicated that the residences must be located further east, adjacent to the intersection of Jack Wells Road and Half-Sun Way. The COE also indicated that the project team should consider developing a series of wells to intercept the groundwater going to the relief tunnel as they are presently experiencing deterioration of that facility.

The hatchery plan presented at the March 2004 Steering and Design Committee meeting showed the residences and a dormitory for temporary staff located along Jack Wells Road. The plan also showed a series of 20 wells along the general alignment of the relief tunnel.

11.13.2 USE OF COLVILLE TRIBAL TROUT HATCHERY FACILITIES

In early February of 2004, representatives of the Colville Tribes, the COE and Tetra Tech/KCM held a joint site visit. The site visit included a visit to the nearby Colville Tribes' trout hatchery to evaluate if the Chief Joseph Dam Hatchery residences could conveniently be located at this facility. This hatchery visit also allowed the representatives to review the possibilities of expanding existing facilities such as feed storage and of adding new facilities such as vehicle storage and maintenance areas that would be used in conjunction with the operation of Chief Joseph Dam Hatchery facilities.

11.13.3 FISH REARING FACILITIES

Tetra Tech/KCM presented facility designs for both a summer/fall Chinook hatchery, and a spring and summer/fall Chinook facility [see Chapter 13 for spring Chinook program and facility details]. At the March 2004 Steering and Design Committee meeting Tetra Tech/KCM presented a refinement of a plan (Option A) presented at a previous review meeting. The hatchery facilities needed for the summer/fall Chinook programs were shown in darker ink on the schematics than those needed for the spring Chinook programs, in order to distinguish the physical impacts of adding the spring Chinook programs. The most notable impacts are the lengthening of the start tank room of the hatchery building and the addition of the group of raceways for spring Chinook rearing.

The bioengineering model was refined, resulting in the updated numbers and sizes of the rearing facilities. The largest change was in the raceway volume, previously estimated at 115,000 cubic feet, which was calculated to be about twice that amount. Further evaluation of rearing requirements will occur during future phases of the facility design.

The March facility design incorporated an adult holding area that allows mechanical crowding of fish out of the holding channels into a common channel leading to the spawn building. Fish could also be mechanically crowded from this common channel. This facility was designed to allow visitor viewing of some of the channels and window viewing of spawn house activities.

11.13.4 FISH LADDER

The COE is currently developing a contract to reshape and re-armor some of the river embankment in the area of the fish ladder entrance. This work will be completed during the design of the Chief Joseph Dam Hatchery and may affect the location of the ladder entrance. A study is also now being conducted to determine where adult fish are swimming along this portion of the river in order to try to assess the best fish ladder entrance location.

Members of the Steering and Design Committee raised concerns about the length of the fish ladder. The fish ladder entrance is located in an apparent indent along the embankment, about 1,500 feet upstream of the adult holding area. The ladder is shown to climb along an old road grade at a 1:10 slope, requiring about 70 weir steps to rise to an open channel that continues along the embankment to the adult holding area. Tetra Tech/KCM was directed to relocate the adult holding area to an elevation of about 810 feet near the fish ladder entrance.

11.13.5 TAGGING/FIN CLIP BUILDING

At the third Steering and Design Committee Meeting in March, a decision was made to eliminate the tagging/fin clip building in lieu of portable trailers holding the required equipment. This decision was based on potential cost savings and flexibility.